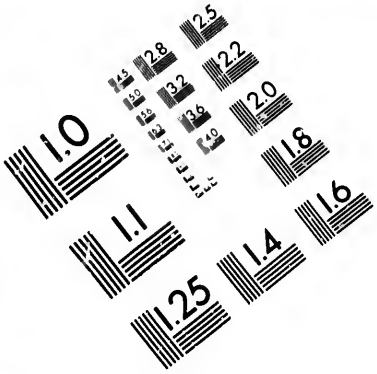

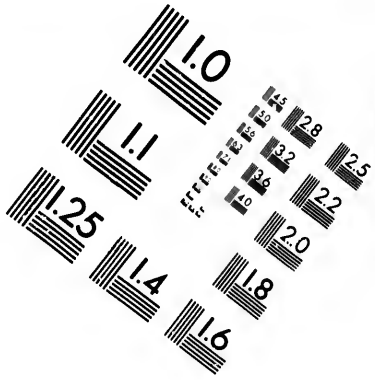

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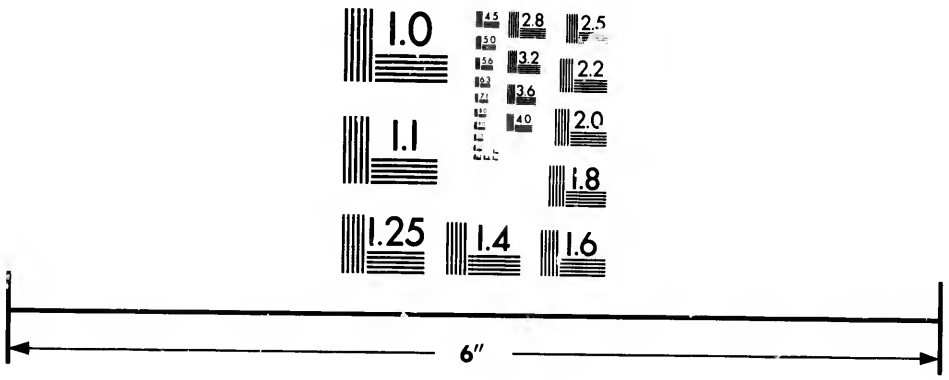

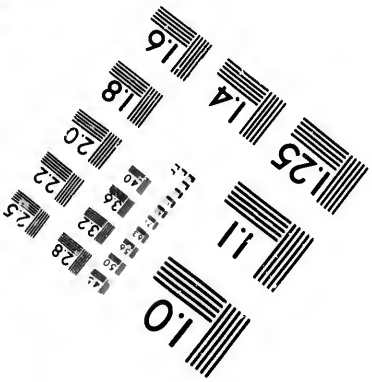

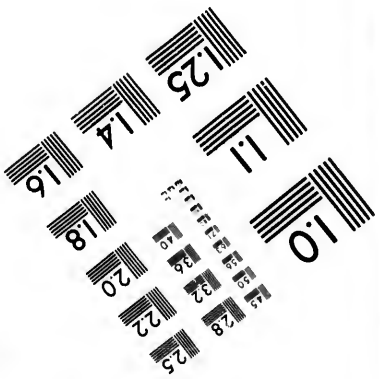

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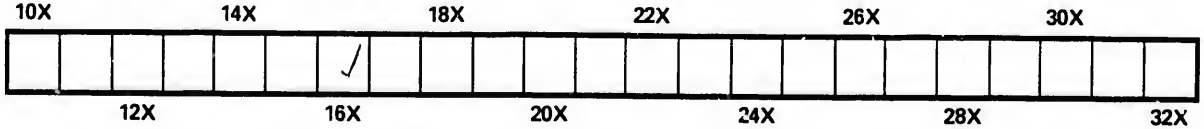

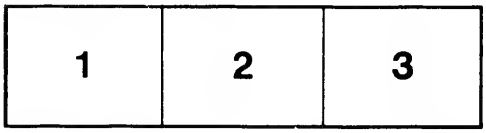

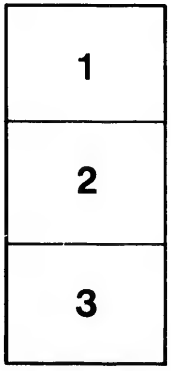

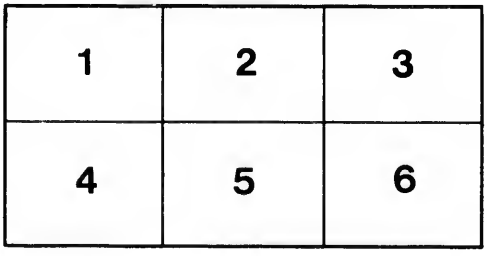

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AND

PETER O'HEARN,

PRINCIPAL OF ST. PATRICK'S BOYS' HIGH SCHOOL, HALIFAX.

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SENECA.

PART THREE.

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CONTENTS.

COMPOUND NUMBERS.

TO EXPRESS THE VALUE OF A DENOMINATE FRACTION.

1. EXAMPLE 1.—Express $\frac{4}{7}$ mi. in furlongs, etc.

$\frac{4}{7}$ of a mile $= \frac{1}{7}$ of 4 miles.

7 | 4 mi.

0 mi. 4 fur. 22 rd. 4 yd. 2 ft. $1\frac{5}{7}$ in. *Ans.*

EXAMPLE 2.—Find the value .27895 of a ton.

.27895 T
20
5.579 cwt.
100
57.9 lb.
16
14.4 oz.
16
6.4 dr.

Here .27895 of 20 cwt. = 5.579 cwt.
.579 of 100 lb. = 57.9 lb.
.9 of 16 oz. = 14.4 oz.
.4 of 16 dr. = 6.4 dr.

5 cwt. 57 lb. 14 oz. 6.4 dr. *Ans.*

EXERCISE I.

Find the value of:

1. $\frac{5}{6}$ of a mile.
2. $\frac{4}{9}$ of a ton.
3. $\frac{7}{12}$ of £1.
4. $\frac{3}{14}$ of an acre.
5. $\frac{10}{11}$ of a pound (av.)
6. $\frac{20}{33}$ of a furlong.
7. $\frac{3}{13}$ of a sq. mile.
8. $\frac{1}{6}$ of a year.
9. $\frac{7}{9}$ of $\frac{5}{7}$ of a yard.
10. $\frac{2}{3}$ of $\frac{4}{5}$ of £1
11. .4785 of a bushel.
12. .0975 of a mile.
13. .888 T.
14. .0065 sq. mi.
15. .6275 of a pound sterling.
16. .2946 of a kilogram.
17. .575 of an acre.
18. 3.45 sq. yd.
19. 19.3425 fur.
20. .6684 of a ton.

TO FIND THE VALUE OF THE FRACTION OF A COMPOUND QUANTITY.

2. Example 3. Find the value of $\frac{5}{6}$ of 17 da. 16 hr. 45 min. 30 sec.

	17 da.	16 hr.	45 min.	30 sec.
				5
6)	88	11	47	30
	14 da.	17 hr.	57 min.	55 sec. *Ans.*

EXERCISE II.

Find the value of:

1. $\frac{3}{5}$ of 7 T. 15 cwt. 56 lb. 10 oz.
2. $\frac{9}{10}$ of 16 lb. 9 oz. 16 dwt. 20 gr.
3. $\frac{2}{7}$ of 5 A. 100 sq. rd.
4. $\frac{11}{15}$ of 12 bu. 3 pk. 1 gal. 3 qt.
5. $\frac{1}{2}$ of $\frac{4}{9}$ of 3 mi. 4 fur. 35 rd. 4 yd.
6. .25 of £34 6s. $8\frac{3}{4}$d.
7. .625 of 82.1^{Em}.
8. $\frac{1}{3}$ of $2\frac{1}{2}$ T. + $\frac{4}{5}$ of 17 cwt. + $\frac{3}{4}$ of 57 lb.
9. $\frac{9}{10}$ of 13 da. 15 hr. + $\frac{11}{73}$ of 365 da. + $\frac{1}{7}$ of 2 hr.
10. 4.5 of 7 yd. + 9.75 of 2 ft. + 3.25 of 10 in.
11. 5.875 T. − 19.15 cwt.
12. $\frac{2}{3}$ of $\frac{3}{5}$ of ($92.05 + $17.63 − $40.)
13. $\frac{7}{8}$ of (17 cwt. 32 lb. − 14 cwt. 40 lb. 12 oz.)
14. $\frac{17}{20}$ of the sum of 18.5^{g}, 3.115^{Kg}, 3000^{mg}.
15. $\frac{1}{4}$ of a year + $\frac{1}{5}$ of a week + $\frac{1}{7}$ of an hour + $\frac{1}{9}$ of a minute.

TO EXPRESS ONE COMPOUND NUMBER AS A FRACTION OF ANOTHER.

3. EXAMPLE 4. What fraction of a mile is 14 rd. 5 yd. 2 ft.?

$$\frac{14 \text{ rd. } 5 \text{ yd. } 2 \text{ ft.}}{1 \text{ mi.}} = \frac{248 \text{ ft.}}{5280 \text{ ft.}} = \frac{31}{660}$$

Since 1 ft. $= \frac{1}{5280}$ of a mile $\therefore$ 248 ft. $= \frac{248}{5280}$ or $\frac{31}{660}$ of a mile.

EXAMPLE 5. Express 15 cwt. 93 lb. 12 oz. as a fraction of 3 T. 3 cwt.

$$\frac{15 \text{ cwt. } 93 \text{ lb. } 12 \text{ oz.}}{3 \text{ T. } 3 \text{ cwt.}} = \frac{25500 \text{ oz.}}{100800 \text{ oz.}} = \frac{255}{1008}$$

Since 1 oz. $= \frac{1}{100800}$ of 3 T. 3 cwt. $\therefore$ 25500 oz. $= \frac{255}{1008}$ of 3 T. 3 cwt.

EXERCISE III.

Express :

1. 6s. 8d. as a fraction of £1.
2. 8 lb. 8 oz. as a fraction of 1 cwt. 2 lb.
3. £244 11s. 7d. as a fraction of £978 6s. 4d.
4. 15 da. 12 hr. 51 min. 12 sec. as a fraction of 41 da. 10 hr. 16 min. 32 sec.
5. 38 sq. rd. 15 sq. yd. 7 sq. ft. as a fraction of 57 sq. rd. 23 sq. yd. 6 sq. ft.
6. A pound troy as a fraction of a pound avoirdupois?
7. 1 oz. avoirdupois as a fraction of 1 oz. troy.
8. $\frac{3}{5}$ of 95 lb. as a fraction of $1\frac{1}{4}$ T.
9. 872^{m} as a fraction of 3.924^{Km}.
10. 85 cu. yd. 20 cu. ft. as a fraction of 428 cu. yd. 19 cu. ft.
11. 82 bu. 1 pk. 2 qt. as a fraction of 96 bu. 1 qt.
12. 24 da. 15 hr. 49 min. as a fraction of 90 da. 9 hr. 59 min. 40 sec.

TO EXPRESS A COMPOUND QUANTITY AS A DECIMAL OF ONE DENOMINATION.

4. EXAMPLE 6. Express 4 fur. 30 rd. 4 yd. 2 ft. 6.24 in. in miles.

12 | 6.24 in.
.52 ft.
3 | 2.52 ft.
.84 yd.
$5\frac{1}{2}$ | 4.84 yd.
2
11 | 9.68
.88 rd.
40 | 30.88 rd.
.772 fur.
8 | 4.772 fur.
.5965 mi.

12 | 6.24 in.
3 | 2.52 ft.
$5\frac{1}{2}$ | 4.84 yd.
11 | 9.68
40 | 30.88 rd.
8 | 4.772 fur.
.5965 mi.

Here the 6.24 in. = .52 ft. To this we add the 2 ft. making 2.52 ft. The 2.52 ft. = .84 yd. To this we add the 4 yd. 4.84 yd. = .88 rd. We add the 30 rd. Then the 30.88 rd. = .772 fur. And lastly the 4.772 fur. = .5965 miles.

EXERCISE IV.

Express:

1. 3 cwt. 75 lb. in tons.
2. 11s. $8\frac{1}{2}$ d. as a decimal of £1.
3. 38 rd. 1 yd. 3.6 in. in miles.
4. 13 cents as the decimal of $1.
5. 2 da. 7 hr. as the decimal of a week.
6. 894[1] as a decimal of a kiloliter.
7. 2 pk. 1 gal. 3 qt. 1 pt. in bushels.
8. 128 sq. rods in sq. miles.
9. 12.96 gr. in pounds (ap.).
10. 102 lb. 6 oz. 5 dr. + 74 lb. 3 oz. + 323 lb. + 6 oz. 11 dr. in tons.

In No. 10 add the quantities first.

TO REDUCE WEIGHTS AND MEASURES FROM ONE SYSTEM TO ANOTHER.

5. EXAMPLE 7. Express 163.5^{m} in yards, etc.

$1^{m} = 39.37$ in.

$\therefore 163.5^{m} = 39.37$ in. $\times 163.5$.

$= 6436.995$ in. $= 178$ yd. 2 ft. 4.995 in.

Or $163.5^{m} \times 1.0936 =$ yards required.

EXAMPLE 8. Express 427 yd. 1 ft. 10 in. in meters.

$$39.37 \text{ in.} = 1^{m}$$

$$\therefore 1 \text{ in.} = \frac{1^{m}}{39.37}$$

$$\therefore 427 \text{ yd. } 1 \text{ ft. } 10 \text{ in. or } 15394 \text{ in.} = \frac{1^{m} \times 15394}{39.37} = 391.008^{m} +$$

EXERCISE V.

1. Express 250^{m} in yards.

2. Express 412.8^{m} in yards.

3. In 72^{m} how many feet?

4. In 1000^{m} how many yards?

5. How many meters in 2 rd. 4 yd. 2 ft. 9 in.? [1 yd. $= .9144^{m}$].

6. How many meters in 2 fur. 158 yds.?

7. In $729\frac{1}{4}$ yd. how many meters?

8. In 17 yd. 2 ft. $7\frac{3}{4}$ in., how many meters? Centimeters?

9. Express 10000^{m} in miles, etc.

10. Express 2 mi. 5 fur. 4 yd. in meters.

11. How many miles, etc., in 89.6^{Km}?

$89.6^{Km} = 89600^{m}$, and the ex. may be done as example **7.** Or,

$1^{Km} = .62137$ mi.

$\therefore 89.6^{Km} = .62137$ mi. $\times 89.6$.

$= 55.674752$ mi. or 55 mi. 5 fur. 15 rd. 5 yd. 2.28 + in.

12. Express 100^{Km} in miles, etc.

13. Express 156.466^{Km} in miles.

14. In 100 mi. how many kilometers? [1 mi. $= 1.60935^{Km}$].

15. In 53 mi. 4 fur. how many kilometers?

6. EXAMPLE 9. Express 945^{l} in gallons, etc.

$1^{l} = .8804$ qt.

$\therefore 945^{l} = .8804$ qt. $\times 945$

$= 831.978$ qt. or 207 gal. 3 qt. 1.956 pt.

EXAMPLE 10. Express 86 gal. 3 qt. 1 pt. in liters. In hektoliters.

$$.8804 \text{ qt.} = 1^{l}$$

$$\therefore \quad 1 \text{ qt.} = \frac{1^{l}}{.8804}$$

$$\therefore 86 \text{ gal. } 3 \text{ qt. } 1 \text{ pt. or } 347.5 \text{ qt.} = \frac{1^{l} \times 347.5}{.8804} = 394.7^{l}+$$

$$= 3.947^{Hl}+.$$

Or thus: Since 1 qt. $= 1.136^{l}$

$\therefore 347.5$ qt $= 1.136^{l} \times 347.5 = 394.7^{l}+.$

EXERCISE VI.

Express:

1. 95^{l} in quarts.
2. 905^{l} in gallons, etc.
3. $.750^{l}$ in bushels.
4. 25^{Hl} in bushels, etc.
5. 181.75^{Hl} in bushels, etc.
6. 100 gal. in liters.
7. 414 gal. 1 qt. 1 pt. in liters. In hektoliters.
8. 522 gal. 3 qt. in hektoliters.
9. 79 bu. in hektoliters*. In liters.
10. 312 bu. 3 pk. 1 gal. in hektoliters.
11. What is the value of 3 gal. 2 qt. 1 pt. of molasses at 5 cents per liter?
12. What is the value of 1000^{Hl} of potatoes at 45 cents per bushel?
13. What must be paid for 50^{l} of oil at $5\frac{1}{2}$ cents per quart?
14. A tank 2.5^{m} long, 1.4^{m} wide, and 1^{m} deep is filled with oil worth 4 cents per quart. What is its value?

Cubic contents of cistern $= 2.5^{m} \times 1.4 \times 1 = 3.5^{cu\ m} = 3500^{cu\ dm} = 3500^{l}$.

$3500^{l} = .8804$ qt. $\times 3500 = 3081.4$ qt.

$\$.04 \times 3081.4 = \$123.26$. *Ans.*

*1 bu. $= .3635^{Hl}$.

15. A tank 3^m long, 2^m wide and 1.5^m deep is filled with petroleum worth 20 cents per gallon. What is its value?

16. What will it cost to excavate a cellar 9^m long, 7.5^m wide and 2.4^m deep at $\$1.63\frac{1}{2}$ per cubic meter?

17. What would the cellar mentioned in No. 16 cost at $1.25 per cubic yard?

18. When painting costs $.299 per sq. meter what does it cost per square yard?

19. A puncheon which would hold a metric ton of water has been filled with oats. What is it worth at 50 cents per bushel.

1 metric ton of water $= 1^{cu\ m}$ of water $= 1000^l$ or 10^{Hl}.

20. When timothy seed is $2.50 per bushel how much is it per hektoliter?

7. EXAMPLE 11. Express 855^g in pounds, etc., av.

$$1^g = 15.432 \text{ gr.}$$

$$\therefore\ 855^g = 15.432 \text{ gr.} \times 855 = 13194.36 \text{ gr.}$$

Since 7000 gr. = 1 lb.

$$\therefore\ 1 \text{ gr.} = \tfrac{1 \text{ lb.}}{7000}$$

$$13194.36 = \tfrac{13194.36}{7000} = 1.885 \text{ lb.} = 1 \text{ lb. } 14 \text{ oz. } 2.5 \text{ dr.}$$

Or thus:

$$855^g = .855^{Kg}$$

$$1^{Kg} = 2.2046 \text{ lb.}$$

$$\therefore\ .855^{Kg} = 2.2046 \text{ lb.} \times .855 = 1.885 \text{ lb.} = 1 \text{ lb. } 14 \text{ oz. } 2.5 \text{ dr.}$$

EXAMPLE 12. Express 34 lb. 11 oz. 8 dr. in kilograms.

34 lb. 11 oz. 8 dr. = 34.71875 lb.

Since 1 lb. $= .4536^{Kg}$

$$\therefore\ 34.71875 \text{ lb.} = .4536^{Kg} \times 34.71875 = 25.748^{Kg}.$$

EXERCISE VII.

Express:

1. 600^g in pounds, etc., avoirdupois.

2. 600^g in pounds, etc., troy.

3. 600^g in pounds, etc., apothecaries.

4. 9 lb. 8 oz. avoir. in grams. In dekagrams.

5. 6 cwt. 40 lb. in kilograms. In centigrams.

6. 5T. 10 cwt. 23 lb. in metric tons.

7. 86.25^{Kg} in pounds.

8. 25^{T}. in avoir. weight.

9. 354.5^{g} in pounds troy.

10. 400^{mg} in grains.

11. What will 20^{Kg} of sugar cost at 5 cents a pound?

12. Bought 1000^{Kg} of beef at 10 cents a kilogram, and sold it at 5 cents a pound. What did I gain?

13. Bought 12 bu. of clover seed at $1.75 a bushel, and sold it at 4 cents a pound. What did I gain?

14. What does a hektoliter of wheat weigh?

15. What must I pay for 8.4^{Kg} of tea, at 75 cents a kilogram?

16. What is the value of 80^{Kg} of satin starch, at 15 cents a pound?

17. What is the value of 100 yards of cloth, at 50 cents a meter. [1 yard = $.9144^{m}$].

18. Bought 200^{m} of cloth at $1 a meter, and sold it at $1 a yard. What was the gain?

19. In 2 lb. 9 oz. 15 dwt. 20 gr. how many grams? Kilograms?

20. A merchant bought 360 bushels of wheat at $.95 a bushel, and sold it at $2.85 a hektoliter. What did he gain?

EXAMINATION PAPER. No. 1.

(Time, 1 Hour. Value of each Question, 10).

1. The diameter of the earth is 7912 miles. How many feet is it?

2. What is the height of a horse that stands 14 hands high?

3. A blackboard, $3\frac{1}{2}$ ft. wide, has an area of $44\frac{5}{8}$ sq. f. What is its length?

4. Reduce 960 far. to pounds.

5. How much wheat can be put into 12 sacks, if each sack holds 1 bu. 3 pk. 3 qt. 1 pt.?

6. What part of a mile is $\frac{4}{5}$ of a rod?

7. How much must I pay for 10^{m} of cloth, at $1.50 a yard?

8. Express 10s. 6d. in pounds.

9. What fraction of 2 cwt. 82 lb. 3 oz. is 67 lb. 3 oz.?

10. How many kilometers from Truro to Halifax, the distance being 62 miles?

EXAMINATION PAPER. No. 2.

(Time, 1 Hour. Value of Each Question, 10.)

1. Express £.175 in shillings and pence.

2. How many times is 2 A. 152 sq. rd. contained in 44 A. 40 sq. rd.?

3. How many inches in 2 mi. 3 fur. 21 rd. 3 yd. 2 ft. 11 in.?

4. Express $92\frac{1}{2}$ lbs. av. in troy weight.

5. In a pile of wood 60 feet long 8 ft. wide and 4 ft. high, how many cords?

6. How many days, of 12 hours each, will it take to count a million at the rate of 100 a minute?

7. A druggist bought 288 lb. magnesium sulphate at 50 cents per pound av. and retailed it at 5 cents an ounce ap. What did he gain?

8. What is the value of 5 reams 15 quires and 20 sheets of paper at $3.60 a ream?

9. How many steel rails 25 feet long would be needed for 5 miles of railway?

10. What must I pay for 3 pk. 3 qt. of beans at 12 cents a quart?

EXAMINATION PAPER. No. 3.

(Time, 1 Hour. Value of Each Question, 10).

1. What is the value of a rectangular field 80 rd. long and 60 rd. wide at $15 per acre?

2. How many silver spoons, each weighing 2 oz. 5 dwt., can be made from 6 lb. 6 oz. 15 dwt. of silver?

3. What is the value of $\frac{11}{13}$ of an acre at $.35 per sq. rd.?

4. What part of a cubic foot is a cube whose edges are 9 inches long?

5. From $\frac{7}{9}$ of a mile take $\frac{7}{18}$ of a furlong.

6. How much fertilizer will be required for a field of 4 A. 120 sq. rd., allowing 3 bu. 2 pk. 1 gal. to an acre?

7. What is the value of 935.34 lb. of oats at $1.20 per hektoliter?

8. What will be the cost of removing $100^{cn\ m}$ of earth at $.40 per cubic yd.?

9. A man bought a pile of wood 40^{m} long 3^{m} wide and 2^{m} high for $50 and sold it at 30 cents a ster. What did he gain.

10. From an acre of land a man sold 4 house-lots, each 100 ft. by 50. What is the value of the remainder at 1 cent per sq. ft.?

[In how many minutes did you do each of the last three examination papers the first time you did them? In how many minutes can you do one of them now?]

UNITARY METHOD.

8. EXAMPLE 13. If 1 cwt. 24 lbs. of tea is worth \$37.20, what will 1 lb. 14 oz. cost?

1 cwt. 24 lb. = 1984 oz.
1 lb. 14 oz. = 30 "
1984 oz. cost \$37.20,

1 " costs $\frac{\$37.20}{1984}$

30 oz. cost $\frac{\$37.20 \times 30}{1984} = \$0.562+.$

EXAMPLE 14. If I pay \$160.40 for 1 acre 30 rods 20 sq. yds. of land, how much land ought I to get for \$60.15?

1 acre 30 rods 20 sq. yds. $= 5767\frac{1}{2}$ sq. yds.

\$160.40 buy $5767\frac{1}{2}$ sq. yds.

\$1 buys $\frac{5767\frac{1}{2} \text{ sq. yds.}}{160.40}$

\$60.15 buy $\frac{5767\frac{1}{2} \text{ sq. yds.} \times 60.15}{160.40} =$

$2162\frac{13}{16}$ sq. yds. $= 71$ sq. rods $15\frac{1}{16}$ sq. yds.

Observe that the thing of which how much or how many is demanded is put at the end of the line.

EXERCISE VIII.

1. What must be paid for 76 cwt. 69 lbs. of beef, if 15 cwt. 92 lbs. cost \$124.67?

2. If 10 ton 3 cwt. of hay cost \$101.50, what quantity can be bought for \$507.50?

3. If the cost of building 200 rods 20 yds. of road is \$860.40 what will 10 miles cost?

4. Paid \$900.90 for a quarter of an acre of land; how much would 41 sq. feet be worth?

5. What will 37 sq. yds. 4 sq. ft. 120 sq. in. of plastering cost, if 9 sq. yds. 2 sq. ft. cost \$3.50?

6. If 12 lb. 10 oz. of silver cost \$192.50, what must be paid for $5\frac{1}{5}$ oz?

7. If a man can travel 20 miles 10 rods in 3 hours and 40 minutes, how far can he travel in 10 hours at the same rate?

8. What will 45.346 lbs. cost, if .441 lbs. cost £3.9375?

9. Paid $1.44 for a pound troy of mercury; what would a pound avoirdupois cost at the same rate?

10. A certain piece of work was to have been done by 144 men in 36 days. Before the work began, a number of the men went away, and the remainder did the work in 48 days. How many men went away?

11. If 64 yds. carpet, 36 in. wide, will cover a floor, how many yds., 27 in. wide, will cover the same floor?

12. A stick, 3 ft. 3 in. long and standing straight up, throws a shadow 5 ft. 6 in. long. How long a shadow is thrown by a steeple 234 ft. high?

9. The *Assets* of a merchant include all the property owned by him and the debts due him.

10. The *Liabilities* of a merchant are the debts of any kind owing by him.

EXAMPLE 15. A man fails in business and owes $8640. His assets are $6480. What dividend will his creditors receive in the dollar?

Dividend on $8640 $= 6480$

" " $1 $= \frac{6480}{8640} = \$0.75.$

EXAMPLE 16. A man fails in business and pays 75 cents in the dollar. If he owes $8640, what are his assets?

To pay a debt of $1 he has $0.75

" " $8640 he has $\$0.75 \times 8640 = \$6480.$

EXAMPLE 17. A man fails in business and pays 75 cents in the dollar. His assets are $6480. What are his liabilities?

$0.75 pays a debt of $1.

$1 " " $\$.\frac{1}{.75}.$

$6480 " " $\frac{\$1 \times 6480}{.75} = \$8640.$

EXERCISE IX.

1. A bankrupt's liabilities are \$9000 and his assets amount to \$5400. How much does he pay in the dollar?

2. A man owing \$6300 pays 45 cents in the dollar. What are his assets?

3. The assets of a bankrupt firm paying 40 cents in the dollar amount to \$1573.60. What are its liabilities?

4. A merchant's liabilities were \$3649. How much did a creditor get, to whom he owed \$1000, if the dividend was 55 cents in the dollar?

5. How much will a creditor lose to whom a bankrupt, paying 60 cents in the dollar, owes \$880.40?

11. EXAMPLE 18. If it costs \$36 to carry 14 loads of stone 54 miles, how much will it cost to carry 18 loads 49 miles?

Cost of carrying 14 loads 54 miles = $\$36$

" " " 1 load 54 " = $\frac{\$36}{14}$

" " " 1 " 1 mile = $\frac{\$36}{14 \times 54}$

" " " 18 loads 1 " = $\frac{\$36 \times 18}{14 \times 54}$

" " " 18 " 49 miles = $\frac{\$36 \times 18 \times 49}{14 \times 54} = \$42$

EXAMPLE 19. If 70 bushels of oats last 14 horses for 20 days, how many days will 60 bushels last 21 horses?

70 bushels last 14 horses for 20 days.

1 bushel lasts 14 " " $\frac{20}{70}$ "

1 " " 1 horse " $\frac{20 \times 14}{70}$

60 bushels " 1 " " $\frac{20 \times 14 \times 60}{70}$

60 " " 21 horses " $\frac{20 \times 14 \times 60}{70 \times 21} = 11\frac{3}{7}$ days.

In the second line of example 18 we enquire whether the cost of carrying 1 load will be more or less than the cost of carrying 14 loads.

The answer is *less;* therefore we *divide* the \$36 by 14. In the third line we enquire whether the carriage for 1 mile will be more or less than the carriage for 54 miles. The answer is again *less*, so we again *divide*, this time by 54. In the fourth line we enquire whether the carriage of 18 loads will cost more or less than the carriage of 1 load. The answer is *more;* we therefore *multiply* by 18. Finally in the last line we enquire whether the carriage for 49 miles will cost more or less than the carriage for 1 mile. The answer is *more* and we *multiply* by 49.

EXERCISE X.

1. If 14 loads of stone can be carried 54 miles for \$36, how many loads can be carried 49 miles for \$42?

2. If 14 loads of stone can be carried 54 miles for \$36, how many miles can 18 loads be carried for \$42?

3. If 18 loads of stone can be carried 49 miles for \$42, how many loads can be carried 54 miles for \$36?

4. If 18 loads of stone can be carried 49 miles for \$42, how many miles can 14 loads be carried for \$36?

5. If it costs \$42 to carry 18 loads of stone 49 miles, how much will it cost to carry 14 loads 54 miles?

6. If 12 horses plow 11 acres in 5 days, how many horses would plow 33 acres in 18 days?

7. How long will 300 bushels of oats last 48 horses, if 24 horses eat 480 bushels in 40 days?

8. How many cwt. can be carried 60 miles for \$12, if \$4 will pay for the carriage of 3 cwt. for 660 miles?

9. If 24 men can earn \$648 in 3 weeks, how many dollars can 36 men earn in 18 weeks?

10. If 32 pumps can raise 2000 tons of water in 8 hours, how many tons will 16 pumps raise in 20 hours?

11. If 11 men can cut 147 cords of wood in 7 days, when they work 14 hours per day, how many days will it take 5 men to cut 150 cords, working 10 hours a day?

12. I paid \$6 for the loan of \$100 for 1 year. How much must I pay for the loan of \$750 for 3 years?

13. Paid \$42 for the loan of \$200 for $3\frac{1}{2}$ years; how much must be paid for the loan of \$100 for 1 year?

14. A contractor has 15 men working at a piece of

work and finds that it will take 20 days to finish it. How many more men must he employ so as to finish it in 5 days?

15. If 324 men consume 108 barrels of flour in 30 days, how many men will consume 162 barrels in 15 days?

16. Write out five more questions constructed from No. 15, and find their answers.

17. If 25 men can earn \$373.75 in 13 days, what can 7 men earn in 16 days?

18. If 7 men can earn \$128.80 in 16 days, in how many days can 25 men earn \$373.75?

19. How many days will 90 bushels last 6 horses, if 120 bushels last 14 horses 56 days?

20. If 12 horses in 5 days draw 44 tons of stone, how many horses would draw 132 tons the same distance in 18 days?

21. If a man travels 130 miles in 3 days of 14 hours each, in how many days of 7 hours each will he travel 390 miles?

22. If 2 men can build $12\frac{3}{4}$ rods of wall in $6\frac{1}{2}$ days, how long will it take 18 men to build $247\frac{2}{13}$ rods?

23. If 15 men can cut 96 cords of wood in 4 days, how many cords can 9 men cut in 20 days?

24. In digging a cellar, 320 cubic meters of earth, of 6 degrees of hardness, are removed by 16 men in 9 days. How many cubic meters, of 5 degrees of hardness, can be removed by 27 men in 19 days?

25. If I can rent a house worth \$4000 for 8 months for \$180, what ought to be paid for a house worth \$7200 for 5 months?

26. When \$21.25 is paid for the use of \$850 for 5 months, what sum must be paid for the use of \$984 for 1 year and 5 months?

27. If 65 men reap a field of 15 acres in $4\frac{1}{2}$ days, how many men can reap 6 acres in 13 days?

12. EXAMPLE 20. A can do a piece of work in 4 days, B in 6 days and C in 8 days. In how many days can they do the work if they all work together?

A can do $\frac{1}{4}$ in 1 day.
B " $\frac{1}{6}$ " 1 "
C " $\frac{1}{8}$ " 1 "
A + B + C do $\frac{1}{4} + \frac{1}{6} + \frac{1}{8}$ in 1 day.
A + B + C " $\frac{13}{24}$ in 1 day.
A + B + C " $\frac{1}{\frac{24}{13}}$ in $\frac{1}{13}$ day.
A + B + C " $\frac{\frac{24}{13}}{24}$ in $\frac{24}{13}$ days or $1\frac{11}{13}$ days.

EXERCISE XI.

1. A can mow a field in 5 days, B in 6 days and C in 10 days. How long will it take them, working together?

2. A can chop a cord of wood in 12 hours, B in 14 hours and C in 16 hours. How long will it take them, working together?

3. A can reap a field in 9 days, B in 10 days and C in 12 days. If they all work together, how long will it take them?

4. A cistern can be filled by 3 pipes in 18, 20, 25 minutes respectively. How long will it take to fill it if all are open at once? What part of the cistern will be filled in 5 minutes?

5. A quantity of provisions will last a man 10 days and a woman 12 days. How long will they last both?

6. A can do a piece of work in 15 days and B in 20. A works at it 6 days and B 9 days. How much of the work is yet to be done?

7. A can do a piece of work in 9 days and B in 12 days. If A works at it for six days, how long will it take B to finish it?

8. A can plough a field in 14 hours. After working at it for 10 hours he leaves off and B finishes the ploughing in 3 hours. How long would it take B by himself?

9. A can dig a cellar in 24 days and B in 30 days. A works at it for 18 days and is then joined by B. In how many days more will they finish the job?

10. A and B can do a piece of work in 10 days. B can do it alone in 15 days. How long would it take A to do the work alone?

11. A cistern can be filled by a pipe in 20 minutes and emptied by a tap in 16 minutes. If the cistern is full and both pipe and tap open, how long will it take to empty the cistern?

12. If 15 men can perform a piece of work in 22 days, how many men can do another piece of work 4 times as large in a fifth of the same time?

EXAMINATION PAPER. No. 4.

(Time, 1 Hour. Value of Each Question, 10).

1. Simplify $6\frac{3}{8} \times \frac{2}{17}$ of $(1\frac{8}{9} - \frac{9}{10}) - \frac{3}{4} \div \frac{2}{3}$ of 2.

2. Find the quotient of $84.016 \div 837.6$ to six decimal places.

3. Multiply £1.17.6$\frac{1}{2}$ by $\frac{3}{8}$.

4. Find the value of .375 of an acre.

5. How many yards in 10000 meters?

6. Reduce 1 acre 120 sq. rods to square inches.

7. If $\frac{2}{3}$ of a ton of hay is worth \$8, what can I get for \$120?

8. A man engaged in trade lost $\frac{2}{3}$ of his money, after which he gained \$740. He then had \$3500. How much did he lose?

9. If a contractor agreed to do a job of work in 30 days, what part of it ought to be done in $16\frac{1}{2}$ days?

10. If I pay \$36 for the loan of \$200 for 3 years, how much must I pay for the loan of \$600 for $5\frac{1}{2}$ years?

PERCENTAGES.

13. Oral.

1. Of 300 people in a hall 30 are sailors. How many per hundred or *per cent.* are sailors?

2. A man who had $200 spent $16. What number of dollars *per cent.* or per hundred did he spend?

3. What is $\frac{5}{100}$ or 5 *per cent.* of 600? Of 400? Of 200? Of 80? Of 50? Of 40? Of 20?

4. What is 6 *per cent.* of $200? Of $100? Of $25? Of $800? Of $3000? Of $175?

14. *Per cent.* means *per hundred.*

15. The *Sign of Per Cent.* is %.

4 per cent is written 4%. $\frac{2}{5}$ per cent. is written $\frac{2}{5}$%.

4 % of $500 = .04 of $500 = $\frac{4}{100}$ of $500 = $\frac{1}{25}$ of $500.

10 % " " = .10 " " = $\frac{10}{100}$ " " = $\frac{1}{10}$ " "

$8\frac{1}{2}$ % " " = .085* " " = $\frac{8\frac{1}{2}}{100}$ " " = $\frac{17}{200}$ " "

$\frac{2}{5}$ % " " = .004 " " = $\frac{\frac{2}{5}}{100}$ " " = $\frac{2}{500}$ " "

225 % " " = 2.25 " " = $\frac{225}{100}$ " " = $\frac{9}{4}$ " "

EXERCISE XII.

Express as a common fraction in lowest terms, as a decimal, and with the sign of per cent.:

1. 3 per cent.
2. 2 " "
3. 1 " "
4. 6 " "
5. 7 " "
6. 8 " "
7. 12 " "
8. 15 " "
9. 20 " "
10. 25 " "
11. 30 " "
12. 45 " "
13. 60 " "
14. 75 " "
15. 81 per cent.
16. 90 " "
17. 100 " "
18. 150 " "
19. 50 " "
20. 750 " "
21. $12\frac{1}{2}$ " "
22. $6\frac{2}{3}$ " "
23. $33\frac{1}{3}$ " "
24. $6\frac{1}{4}$ " "
25. $16\frac{2}{3}$ " "
26. $14\frac{2}{7}$ " "
27. $11\frac{1}{9}$ " "
28. $9\frac{1}{11}$ " "
29. $66\frac{2}{3}$ per cent.
30. $87\frac{1}{2}$ " "
31. $\frac{1}{125}$ " "
32. $\frac{1}{333}$ " "
33. $\frac{1}{400}$ " "
34. $\frac{1}{250}$ " "
35. $\frac{1}{333\frac{1}{3}}$ " "
36. $\frac{1}{875}$ " "
37. $2\frac{3}{4}$ " "
38. $3\frac{1}{8}$ " "
39. $4\frac{3}{5}$ " "
40. $5\frac{7}{10}$ " "

*Or $.08\frac{1}{2}$.

16. The number on which the percentage is computed is called the *Base*.

17. The number of hundredths taken is the *Rate*.

18. The *Percentage* is the number which is a certain number of hundredths of the base.

19. The base with the percentage added is the *Amount*.

20. The base with the percentage deducted is called the *Difference*.

TO FIND THE PERCENTAGE WHEN THE BASE AND RATE ARE GIVEN.

21. ORAL.

1. Find 10% or $\frac{10}{100}$ or $\frac{1}{10}$ of $250.
2. Find 6% or $\frac{6}{100}$ of 900 cows.
3. Find 3% or $\frac{3}{100}$ of 1000 sheep.
4. Find 20% or $\frac{1}{5}$ of $16.50.

EXAMPLE 21. A farmer who had 160 acres of land sold 15% of it. How much remained?

Part sold out of 100 acres = 15 acres.

" " 1 acre $= \frac{15 \text{ acres.}}{100}$

" " 160 acres $= \frac{15 \text{ acres} \times 160}{100} = 24$ acres.

Part remaining = 160 A. − 24 A. = 136 A. Ans.

More briefly: 160 A. × .15 = 24 A.

160 A. − 24 A. = 136 A. Ans.

EXERCISE XIII.

What is :

1. 2 % of 75?
2. 9 % of 90?
3. 7 % of 640?
4. 12 % of $850?
5. 17 % of $320?
6. $12\frac{1}{2}$% of $264?
7. $33\frac{1}{3}$% of $1815?
8. 10 % of $19.50?
9. 5 % of $175.50?
10. 6 % of $4.25?
11. 25 % of 220 acres?
12. 40 % of 245 yards?
13. 55 % of 926^{m}?
14. $2\frac{1}{2}$% of $25.60?
15. $5\frac{1}{4}$% of $84.40?
16. $8\frac{1}{5}$% of $66.75?
17. $7\frac{3}{5}$% of 875^{Kg}?
18. $6\frac{2}{3}$% of 1280 bu.?
19. $\frac{3}{4}$% of $240?
20. $\frac{5}{8}$% of $1056?

How many dollars are made by selling :

21. A cow which cost $22 at a gain of 15%?
22. A horse which cost $125 at a gain of 12%?
23. A wagon which cost $96 at an advance of $6\frac{2}{3}$%?
24. A house which cost $2500 at a gain of $7\frac{1}{2}$%?
25. A farm which cost $3250 at a gain of $12\frac{1}{2}$%?

How many dollars are lost by selling :

26. A lot which cost $600 at a loss of 11%?
27. A railway share which cost $750 so as to lose 18%?
28. A share in a mine which cost $1275 at a loss of 45%?
29. A bicycle which cost $115 at a loss of 22%?
30. Damaged goods which cost $268.80 at a discount of $17\frac{1}{2}$%?

31. A drover bought 350 sheep and then sold 44% of them. How many remained?

32. A man who kept a vegetable garden had 420 heads of cabbage. He sold 30% of them one week and 50% of the remainder the next. How many had he still?

33. 22% of 150 barrels of apples sent to market were spoiled. What did the remainder bring at $3.10 per bbl.?

34. How much land has X, who bought 400 acres and sold $37\frac{1}{2}$% of it?

35. How much iron will be obtained from 1250 tons of ore which yields 42% iron?

36. In a school of 300 children, 32% are under 9 years of age and 28% are between 9 and 12. How many are over 12?

37. What is the present value of a house whose value has decreased 9% since it was purchased for $1830?

38. A man who has a salary of $1600 a year spends on his family 75%, on himself $5\frac{1}{2}$%, and gives away 12%. What does he save?

39. What will be the shrinkage from sponging in 32^{m} of cloth which shrinks $5\frac{1}{2}$%?

40. A man who left an estate of $130000 bequeathed 8% to a church, 12% to an asylum, 4% to a college, 15% to missions and the remainder to his 6 children, share and share alike. What is the share of each child?

TO FIND THE RATE WHEN THE BASE AND PERCENTAGE ARE GIVEN.

22. ORAL.

1. Which is greater $\frac{1}{5}$ or $\frac{20}{100}$ or 20%? $\frac{7}{50}$ or 14%?

2. What part of 30 is 6? How many tenths is it? How many hundredths? What per cent.?

3. What part of 20 is 80? How many per cent.?

4. What per cent. is 30 of 60? 3 of 50? 1 of 10? 1 of 20?

EXAMPLE 22. A farmer who had 450 bu. of oats sold 150 bu. What per cent. did he sell?

Bushels sold out of 450 bu. = 150 bu.

" " " " 1 bu. = $\frac{150 \text{ "}}{450}$

" " " " 100 bu. = $\frac{150 \times 100}{450}$

= $33\frac{1}{3}$. ANS. $33\frac{1}{3}$%.

Or thus: Part sold = $\frac{150}{450} = \frac{1}{3} = 33\frac{1}{3}$%.

EXERCISE XIV.

What per cent of:

1. 450 T. is 225 T.?
2. \$160 is \$32?
3. \$720 is \$216?
4. \$85 is \$85?
5. 108 men is 36 men?
6. £24^{m} is 206^{m}?
7. 824^{m} is 20.6^{m}?
8. 1728 is 144?
9. 540 A. is 162A.?
10. 918 bu. is 306 bu.?
11. 680 da. is 510 da.?
12. 2540 is 317$\frac{1}{2}$?
13. 5192 is 233.64?
14. $\frac{2}{3}$ is $\frac{1}{6}$?
15. $\frac{9}{10}$ is $\frac{3}{20}$?
16. 4$\frac{1}{2}$ is 1$\frac{1}{4}$?
17. 62 is 8?
18. 19$\frac{1}{2}$ is 2$\frac{1}{6}$?
19. 100 is 4$\frac{1}{13}$?
20. 175 is 14$\frac{7}{12}$?

21. A grocer sold 55 lb. of sugar from a barrel which had contained 275 lbs. What per cent. did he sell?

22. Of the 210 sheep in a pasture 63 are Southdowns. What percentage are Southdowns?

23. A man pays \$264 rent for a house which was bought for \$2400. What per cent. does the owner realize on his investment?

24. A fruit grower transplanted 325 gooseberry bushes and 88 of them died. What per cent. of them died?

25. In the sentence: *A number is that which answers the question "how many?"* what per cent. of the letters are vowels?

26. At an examination in history a boy spelled correctly 432 of the 450 words he wrote. What per cent. were spelled correctly?

27. A poulterer who raised 180 chickens sold them all but 27. What per cent. did he sell?

28. A farmer raised 440 bushels of wheat. He sold $\frac{2}{5}$ of it in October and $\frac{2}{3}$ of the remainder in November. What per cent. remained unsold?

29. 119.7 tons of iron were obtained from 285 tons of ore. What per cent. of iron does the ore yield?

30. A gentleman finding that he was becoming more deeply involved in debt, to save his creditors, made an

assignment. His debts amounted to $9385 and his property realized $7695.70. What per cent. of what was due him did each creditor receive?

TO FIND THE BASE WHEN PERCENTAGE AND RATE ARE GIVEN.

23. ORAL.

1. Of what sum of money is $5 20% or $\frac{1}{5}$?

2. A farmer who sold 50% of his barley sold 40 bushels. How many bushels had he?

3. Of what number is 60 25%? 30%? 5%?

4. A lady who paid $100 for a seal-skin sacque, paid 75% of her money. How much had she?

EXAMPLE 23. A man made a payment of $312 on his house, which was 12% of its cost. What was the value of the house?

$$12\% \text{ or } \tfrac{12}{100} = \$312$$

$$\tfrac{1}{100} = \frac{\$312}{12}$$

$$\tfrac{100}{100} = \frac{\$312 \times 100}{12} = \$2600.$$

EXERCISE XV.

Find the number of which:

1.	9	6%	13.	30	$7\frac{1}{2}$%
2.	10	8%	14.	76	$2\frac{1}{2}$%
3.	12	2%	15.	91	$3\frac{1}{2}$%
4.	17	4%	16.	399	21 %
5.	23	5%	17.	77.5	10 %
6.	39	6%	18.	93.5	11 %
7.	63	7%	19.	14.7	15 %
8.	224	7%	20.	298.9	35 %
9.	72	25%	21.	321	$33\frac{1}{3}$%
10.	728	13%	22.	602.55	65 %
11.	105	14%	23.	570	120 %
12.	333	18%	24.	$164\frac{1}{4}$	$4\frac{1}{2}$%

25. A fruit-grower sold 20% of his strawberries for $60. What were all his strawberries worth?

26. A man sold a horse and received $49 cash. This was 35% of the price of the horse. Find the price.

27. By selling a house at an advance of 16% on the cost there was a gain of $100. What was the cost?

28. A farmer sold 15% of his oats at $0.60 per bushel and received $27. How many bushels had he at first?

29. Into a vessel containing vinegar there were thrown $17\frac{1}{2}$ liters of water. The water was then 14% of the dilution. How many liters of vinegar were there?

30. A man received a post office order for $13.11 which was 15% of the amount of his bill. What was the bill?

31. A man paid $47.50 on a lot which was $16\frac{2}{3}$% of the cost. Find the cost.

32. What was the price of a piece of land when the $3\frac{1}{2}$% deposit paid on it amounted to $93.80?

33. A farmer who sold 87% of his corn had 260 bushels left. How many bushels did he raise?

34. A cable laid between Newfoundland and Ireland snapped $121\frac{1}{2}$ miles from N'f'l'd. This was $7\frac{1}{2}$% of its whole length. Find its length.

35. An assignee who paid debts to the amount of $1736 paid 31% of the whole indebtedness. How many dollars remained unpaid?

TO FIND THE BASE WHEN THE AMOUNT AND RATE, OR THE DIFFERENCE AND RATE, ARE GIVEN.

24. ORAL.

1. A dealer gains $\frac{1}{5}$ or 20% of the cost in selling a horse. How many fifths or what per cent. of the cost does he get? Ans. $\frac{6}{5}$ or 120%.

2. The same dealer loses $\frac{1}{4}$ or 25% of the cost of another horse in selling him. How many fourths or what per cent. of the cost does he get? Ans. $\frac{3}{4}$ or 75%.

3. If a merchant sells goods at a gain of 18%, what per cent. does he get? If at a loss of 15%, what per cent. does he get?

4. What number increased by 10% of itself equals 110? Decreased by 10% equals 90? Increased by 10% of itself equals 55? Diminished by 10% of itself equals 45?

EXAMPLE 24. What number increased by 15% of itself equals $609\frac{1}{2}$?

$$115\% \text{ of the number} = 609\tfrac{1}{2}$$
$$1\% \text{ " " } = \frac{609\frac{1}{2}}{115}$$
$$100\% \text{ " " } = \frac{609\frac{1}{2} \times 100}{115} = 530.$$

Or thus: 1.15 of number $= 609\frac{1}{2}$

$$1 \text{ " " } = \frac{609\frac{1}{2}}{1.15} = 530.$$

EXAMPLE 25. What number decreased by 16% of itself equals 714.

$$84\% \text{ of the number} = 714$$
$$1\% \text{ " " } = \frac{714}{84}$$
$$100\% \text{ " " } = \frac{714 \times 100}{84} = 850.$$

Or thus: $.84$ of number $= 714$

$$1 \text{ " " } = \frac{714}{.84} = 850.$$

EXERCISE XVI.

What number increased by:

1. 5% of itself equals 756?
2. 8% " " " 405?
3. 30% " " " 533?
4. 35% " " " 324?
5. $16\frac{2}{3}\%$ " " " 350?
6. 12% " " " 252?
7. 100% " " " 708?
8. 125% " " " 1188?
9. $5\frac{3}{4}\%$ " " " $1057\frac{1}{2}$?
10. $6\frac{1}{4}\%$ " " " 935?

What number diminished by :

11. 7% of itself equals 186 ?
12. 8% " " " 736 ?
13. 13% " " " 435 ?
14. 4% " " " 273.6 ?
15. 19% " " " 2511 ?
16. 20% " " " 333.6 ?
17. $33\frac{1}{3}$% " " " 612 ?
18. 100% " " " 0 ?
19. 75% " " " 7 ?
20. $22\frac{1}{2}$% " " " 57.35 ?

What number as it is increased or diminished by :

21. 5% of itself is 399 or 361 ?
22. 11% " " " 999 or 801 ?
23. $12\frac{1}{2}$% " " " 382.5 or 297.5 ?
24. $17\frac{1}{4}$% " " " 1594.6 or 1125.4 ?

What number increased and what number diminished by :

25. 20% of itself equals 624 ?
26. 25% " " " 345 ?
27. 30% " " " 196 ?
28. $33\frac{1}{3}$% " " " 240 ?
29. $16\frac{2}{3}$% " " " 420 ?
30. 17% " " " 585 ?

31. The value of a lot of land increased 18% and now it is $649. What was its former value ?

32. The value of a gold claim decreased 22% and now is $1014. What was its former value ?

33. A man after improving a farm sold it for $1961, which was 85% more than he paid for it. What did he pay ?

34. A farmer had 20% more oats than wheat and 20% more wheat than barley. If he had 600 bushels of oats how much barley had he ?

35. A clerk whose salary was increased 15% now has $920. What was his former salary?

36. The property of a bankrupt, sold at auction, realized $5796, which was 28% less than the value of the property. What was its value?

37. A man spent 65% of his money and had $6.37 left. What sum had he at first?

38. 32% of the men in a regiment being sick only 578 men were reported for duty. How many men were in the regiment?

39. A young man paid $22.95 for a suit of clothes, which was 10% less than the marked price. What was the marked price?

40. Two men own 1 share each in different gold mines. A's share decreased in value 10% and B's increased in value 12½%. Each is now worth $900. What was the former value of each?

PROFIT AND LOSS.

25. Gain or loss is generally reckoned as a per cent. of the cost.

EXERCISE XVII.

1. A Jersey cow, bought for \$48, was sold at a gain of $8\frac{1}{3}\%$. What was the gain?

2. A horse, which cost \$175, was injured so that he was sold at a loss of 20%. What was received for him?

3. An upholsterer sold a suite of furniture which cost \$75 at a gain of 30%. What did he gain?

4. A man who owned a lot in Los Angelos sold it at a loss of 27%, or of \$540. What did it cost him?

5. A ship was sold at a gain of \$1200, or $2\frac{1}{2}\%$ of the cost. For what was the ship sold?

6. A man moving to Manitoba sold his piano, which cost him \$350, at a loss of 24%. What did he get for it?

7. A merchant marked his goods 20% above cost. What was his profit on a sale of \$18.65?

8. A web of Scotch tweed was marked \$1.10 per yard, which was 25% above cost. What was the profit on a sale of 9 yards at \$1.05 per yard?

9. A grocer bought 1870 lbs. of sugar at $4\frac{1}{2}$ cents a pound, and sold it at a gain of 8%. What was his gain?

10. A newsboy made $\frac{3}{4}$ of a cent on each paper, which was $33\frac{1}{3}\%$ of the cost. Find cost and selling price of each paper.

11. When 127 bbls. of flour, which cost \$4.80 per barrel, are sold at a gain of $7\frac{1}{2}\%$, what is the gain?

12. What per cent. is gained by selling for \$5.04 per barrel flour which cost \$4.50?

Gain on \$4.50 = \$0.54.

" \$1.00 = $\frac{\$0.54}{4.50}$

" \$100 = $\frac{\$0.54 \times 100}{4.50}$ = \$12, or 12%.

13. What per cent. is gained by selling at \$0.50 per lb. tea which cost \$0.40?

14. Sheep which cost \$4.50 each were sold at \$4.95. What was the gain per cent.?

15. A building lot bought for \$750 was sold for \$615. What was the per cent. of loss?

16. A man bought a house for \$1560 and after spending \$320 in improving it he sold it for \$2162. What was the per cent. of gain?

17. Find the cost per yard of cloth on which an advance of \$0.08 per yard is a gain of $16\frac{2}{3}\%$?

18. A horse which cost \$100 was sold at a gain of 10% to A, who sold him at a gain of 10% to B. B sold him at a loss of 10% to C, who sold him at a loss of 10% to D. What did the horse cost D?

19. A wholesale house made a profit of \$8216 in a year on goods sold at a gain of $6\frac{1}{2}\%$. What was the cost of the goods?

20. A grocer gained 15% by selling corn meal at \$3.45 per barrel. What was the cost?

$$115\% \text{ of price} = \$3.45.$$
$$1\% \text{ " " } = \frac{\$3.45}{115}$$
$$100\% \text{ " " } = \frac{\$3.45 \times 100}{115} = \$3.$$

21. A man lost 12% on land which he sold at \$30.80 per acre. What was the cost?

$$88\% \text{ of cost} = \$30.80.$$
$$1\% \text{ " " } = \frac{\$30.80}{88}$$
$$100\% \text{ " " } = \frac{\$30.80 \times 100}{88} = \$35.$$

22. A carriage sold at \$128.40 was at a gain of 7%. What was the cost?

23. A boat sold at \$253 was at a loss of 8%. What was the cost?

24. A grocer bought rolled oats which retailed at \$4 per barrel at a discount of $12\frac{1}{2}\%$ and sold it at the retail price. What per cent. did he gain?

25. A merchant marked a line of goods at an advance of 25% on cost and then gave a discount of 20% for cash. What did he clear on cash sales amounting to $500?

26. A carpenter sold two houses for $2400 each. On one he gained 20%, and on the other he lost 20%. What was gained or lost by the transaction?

27. Cloth is marked at 15c. per yard which is 25% above cost. What is gained by selling 25 yards at 13c. per yard?

28. Mr. Smith sold a horse at a gain of $33\frac{1}{3}$% and with the proceeds purchased a second horse which he sold at a loss of 15% for $136. What was his gain or loss?

29. A merchant tailor bought cloth at a wholesale discount of 30% and sold it at retail price. What per cent. does he make?

30. How many per cent. above cost must goods be marked so that when a reduction of 10% of the marked price is made there will still be a gain of 17%?

EXAMINATION PAPER, No. 5.

(TIME, 1 HOUR. VALUE OF EACH QUESTION, 10).

1. If 8 teams can plough a certain field in 14 days, in how many days can 12 teams plough a field 3 times as large?

2. From a city lot containing $\frac{3}{5}$ of an acre 60 sq. rd. are sold. What is the value of the remainder at 10 cents per sq. yard?

3. Divide 6014.50451 by 20.041.

4. A wholesale dry-goods merchant bought 3600^{m} of flannel at $0.35 per meter, and sold it in one lot at $0.35 per yard. What did he gain?

5. When $4\frac{1}{2}$ bushels of clover seed can be bought for $10.80, what must I pay for 25 lbs.

6. A country merchant who bought $650 worth of goods from a St. John firm got a wholesale discount of 20% and then a cash discount of 5%. What sum did he pay?

7. What per cent. of the letters are vowels in the sentence: *We learn to do by doing?*

8. A young man bought a bicycle for \$120, and after using it one year sold it at a loss of 30%. What he got for the old one was $66\frac{2}{3}\%$ of what he paid for a new one. What did the new one cost?

9. A man sold $\frac{2}{3}$ of a piece of land for what $\frac{3}{4}$ of it cost him. What was the gain per cent.?

10. Lime in slaking absorbs $2\frac{1}{2}$ times its weight of water. What is the weight of 2 casks of lime (each 240 lb.) after being slaked?

TAXES.

26. Fixed property, as lands, houses, etc., is called *Real Estate.*

27. Movable property, as cattle, furniture, money, etc., is called *Personal Property.*

EXAMPLE 26. In a town where the rate of taxation is $1\frac{1}{4}\%$, what tax must a man pay whose real estate is valued at $1500 and personal property at $700?

$$\text{Tax} = \$5200 \times .01\tfrac{1}{4} = \$65.$$

EXAMPLE 27. In a school section where $450 is voted for school purposes the assessable property is valued at $65000, and there are 30 persons subject to a poll tax of $1 each. What property tax must a man pay whose property is valued at $1300?

$450 − $30 = $420, amount to be levied on property.

Tax on $65000 = $420

" $1 $= \frac{\$420}{65000}$

" $1300 $= \frac{\$420 \times 1300}{65000} = \$8.40.$

EXERCISE XVIII.

1. What tax is paid by a man rated $\frac{3}{4}\%$ on property estimated at $3250?

2. In a town where the various taxes amount to $1.35 per cent., what must be paid by the owner of property worth $2460?

3. In a school section where the taxable property is valued at $84600, the sum levied for the year is $390. What must be paid by the owner of property worth $1410?

4. In a city where the civic rates are 90 cents per $100, school rates $22\frac{1}{2}$ cents per $100, and poor rates 15 cents per $100, what will a man have to pay whose real estate is valued at $16700 and personal property at $1100?

5. In a country where the county or municipal rates, the school rates and the poor rates are respectively \$.55, \$.20 and \$.05 per \$100, what amount of tax must be paid by a farmer whose real estate is valued at \$1350 and personal property at \$430.

6. The rates in the city of Halifax for 1895-6 were: City tax 89 cents per \$100 or .89%, county tax 5 cents per \$100 or .05%, and school tax 44 cents per \$100 or .44%. What was the amount of a man's taxes whose property was assessed at \$2880 ?

COMMISSION.

28. ORAL.

1. A commission merchant sells $300 worth of potatoes for a farmer at a commission of 5% of the sales. How much will the merchant receive?

2. At 3% commission what will an agent receive for selling $800 worth of goods? What will be the *net proceeds*, or part left after paying all expenses of selling?

3. If 2% commission is paid for buying goods, what is the cost of each $100 worth of goods bought? Ans. $102. How many dollars worth can be bought for $102 after paying the broker's commission of 2%? For $204? $306? $612?

29. *Commission* is a sum paid to an **agent, commission merchant** or **broker** for buying or selling goods or other property. It is always a percentage either of the amount *invested* or of the amount *collected* as the case may be.

EXAMPLE 28. An agent sells $235 worth of goods on a commission of $2\frac{1}{2}\%$. What is his commission?

$$\text{Commission} = \frac{2\frac{1}{2}}{100} \text{ or } .025 \text{ of } \$235 = \$5.875.$$

EXAMPLE 29. Mr. Forbes sent his agent $1785 to invest in goods after deducting his own commission of 2%. How many dollars were invested in goods?

As the agent gets $2 for each $100 he invests, $102 must be sent for each $100 that is invested. Hence,

$$\text{Sum invested out of } \$102 = \$100$$
$$\text{“ “ “ “ } \$1 = \$\frac{100}{102}$$
$$\text{“ “ “ “ } \$1785 = \frac{\$100 \times 1785}{102} = \$1750.$$

If the question be to find the agent's commission the solution is.

$$\text{Commission} = \frac{2}{102} \text{ of } \$1785 = \$35.$$

EXERCISE XIX.

1. What is an agent's commission on sales amounting to \$800 at $1\frac{1}{4}\%$?

2. A lawyer collected a note of \$474. How much did he pay the owner of the note after charging 5% for collecting?

3. Sent an agent in Montreal \$4635 to purchase pork. How many barrels will he send after deducting his commission of 3%, pork costing \$15 per barrel?

4. A broker buys \$8000 worth of stocks at a commission of $\frac{3}{8}\%$. What is his commission?

5. A fruit-grower sent 320 barrels of apples to Halifax which were sold at an average price of \$2.85. Find the agent's commission at $3\frac{1}{2}\%$?

6. My agent in Jamaica invested \$3000 in oranges and lemons which he sent me by *S. S. Alpha*. Find his commission at 4%. What would his commission be if I had sent him \$3000 with instructions to deduct his commission and invest the balance?

7. A real estate agent was paid \$400 for collecting rents. How much did he collect, his commission being 5%?

8. Sent an agent in Toronto \$9135 to purchase flour, deducting his own commission of $1\frac{1}{2}\%$. How many barrels were sent me, the average price being \$4.50 per barrel?

9. A lawyer succeeded in collecting 75% of a debt of \$860. How much did the creditor receive after paying the lawyer 6% commission?

10. A country dealer sent an agent in St. John, butter, eggs, oats, etc., with instructions to invest the net proceeds in goods, deducting his own commission. The produce sold for \$315.40. The commission for selling was 5% and for buying 3%. Find each commission and the value of the goods sent to the dealer.

INSURANCE.

30. ORAL.

1. What will it cost to *insure* my house, that is to secure myself against loss by fire, to the extent of \$2000, if an annual sum or *premium* of 1% is charged by those who take the risk?

2. What will it cost to insure a ship for \$20000 at a premium of 2%?

EXAMPLE 30. What will it cost to insure a house worth \$6000 for $\frac{3}{4}$ of its value at $1\frac{1}{2}\%$ premium?

Insurance $= \frac{3}{4}$ of \$6000 $=$ \$4500.

Premium $= \frac{1\frac{1}{2}}{100}$ or .015 of \$4500 $=$ \$67.50.

EXERCISE XX.

1. A house worth \$4500 was insured for $\frac{2}{3}$ of its value at $1\frac{1}{4}\%$. What was the annual premium?

2. A man who owns 9 houses of an average value of \$1600, has them all insured at $\frac{3}{4}$ of their value at $\frac{1}{2}\%$. How much does the insurance cost him?

3. A woollen factory worth \$9600 is insured for $\frac{2}{3}$ of its value at $5\frac{1}{2}\%$. What is the yearly premium?

4. Mr. Jones insured a house which cost him \$5400 for $\frac{2}{3}$ of its value at $1\frac{1}{2}\%$. Next day the house was burned. What was Mr. Jones' actual loss?

5. A sailing vessel worth \$16000 and its cargo worth \$9000, are each insured at $\frac{4}{5}$ of their value, the vessel at 2% and cargo at $2\frac{3}{4}\%$. What premium was paid?

6. The yearly premium on a house insured at $\frac{3}{4}\%$ is \$9. With what insurance is the house covered?

7. A merchant in Charlottetown sent a cargo of potatoes and oats to Halifax which when sold by a commission merchant at $3\frac{1}{2}\%$ brought \$3240. The net proceeds of this sale were invested in goods, the agent deducting his commission of 3%. The cargo, both ways, was insured for \$2000 at $2\frac{1}{2}\%$. Find the amount paid in commissions and in premiums.

8. A gentleman whose house is worth \$12000 and furniture \$3200, insures the house at $\frac{3}{4}$ of its value at $\frac{5}{8}\%$ and the furniture at $\frac{7}{8}$ of its value at $\frac{3}{8}\%$. What does he pay each year for the insurance?

SIMPLE INTEREST.

31.—ORAL.

1. If I pay \$6 for the use of \$100 for a year, what must I pay for the use of \$200? Of 500? \$50? \$1000?

2. If I pay \$5 for the use of \$100 for 1 year, what must I pay for the use of \$100 for two years? For 3 years? For 6 years? For the use of \$200 for 2 years?

32. *Interest* is the sum paid for the use of money.

33. The *Principal* is the money for the use of which interest is paid.

34. *Amount* is the sum of principal and interest.

35. *Rate per cent.* is the number of dollars paid for the use of \$100 for 1 year.

TO COMPUTE INTEREST.

EXAMPLE 31. Find the interest of \$650 for 3 years at 6 per cent.

Interest of \$100 for 1 year $= \$6$

" \$1 " " $= \frac{6}{100}$

" \$1 " 3 years $= \frac{\$6 \times 3}{100}$

" \$650 " " $= \frac{6 \times 3 \times 650}{100} = \$117.$

It will be seen from this example that the interest is equal to the continued product of the *Principal*, *Rate Per Cent.* and *Time* expressed in years.

Such exercises can be done more briefly thus:

Interest $= \$650 \times \frac{6}{100} \times 3 = \$117.$

\$650
.06
\$39.00 Interest for 1 year.
3
\$117.00 Interest for 3 years.

EXERCISE XXI.

Find the interest of:

1. \$750 for 2 years at 5%.
2. \$900 for 3 years at 6%.
3. \$315 for 3 years at 4%.
4. \$640 for 4 years at 3%.
5. \$830 for 4 years at 5%.
6. \$780 for 5 years at 4%.
7. \$780 for 4 years at 5%.
8. \$633 for 2 years at 7%.
9. \$7162 for 5 years at 6%.
10. \$1255 for 3 years at 7%.
11. \$25.40 for 6 years at 5%.
12. \$85.50 for 4 years at 4%.
13. \$9250 for $3\frac{1}{2}$ years at 5%.
14. \$89.20 for 2 years at $6\frac{1}{2}$%.
15. \$137.60 for $3\frac{1}{2}$ years at 5%.
16. \$165.80 for $3\frac{1}{4}$ years at $4\frac{1}{2}$%.
17. \$72.85 for $4\frac{1}{2}$ years at $5\frac{1}{2}$%.
18. \$87.50 for $2\frac{1}{5}$ years at $3\frac{3}{4}$%.
19. \$600 for $2\frac{2}{3}$ years at $5\frac{2}{3}$%.
20. \$118.63 for $3\frac{1}{4}$ years at $4\frac{1}{4}$%.

EXAMPLE 32. What is the interest of $342.50 from June 3, 1892, to December 24, 1894, at 6%?

From June 3, '92, to June 3, '94 = 730 days. *
" June 3, '94, " Dec. 24, '94 = 204 "
" June 3, '92, " Dec. 24, '94 = 934 " = $\frac{934}{365}$ years.

$342.50 × .06 × $\frac{934}{365}$ = $52.58.

$342.50
52.58
$395.08 Amount.

$342.50
.06
20.5500 Interest for 1 year.
934
822000
616500
1849500

365)19193.7000($52.58 + Ans.
1825
943
730
2137
1825
3120
2920
200

EXERCISE XXII.

Find the interest of:

1. $120 from May 5, 1880, to June 5, 1881, at 5%.
2. $925 from March 1, 1884, to July 1, 1885, at 6%.
3. $150 from July 10, 1883, to Aug. 10, 1885, at 4%.
4. $167.50 from Dec. 6, 1892, to May 23, 1894, at 7%?
5. $8000 from Feb. 4, 1890, to Nov. 2, 1893, at 6%?
6. $5400 for 2 years 165 days, at 5%?

* A *whole* leap year would be reckoned as 365 days; but as a fraction of a leap year February is reckoned as 29 days.

7. \$875.45 for 1 year 216 days at 6%?

8. \$75.80 for 3 years 127 days at 4%?

9. \$671.25 from Jan. 1, 1875, to Dec. 1, 1876, at 6%?

10. \$6040 from March 15, 1879, to June 10, 1880, at $5\frac{1}{2}$%?

11. \$29.30 from Oct. 1, 1887, to July 19, 1888, at $6\frac{1}{4}$%?

12. \$1305.46 from April 26, 1888, to Feb. 27, 1889, at 5%?

13. \$10000 from May 4 to June 3, at 6%?

14. \$86.45 from Oct. 1, 1889, to Sept. 27, 1891 at 5%?

15. \$2.50 from Nov. 15, 1881, to Feb. 20, 1885, at 7%?

16. \$177.85 for 3 years 25 days at $6\frac{3}{4}$%?

17. \$927.10 for 2 years 7 months at $5\frac{1}{4}$%? [2 years 7 months $= 2\frac{7}{12}$ years].

18. \$706.60 for 1 year 9 months at $6\frac{1}{2}$%?

19. \$3500 for 11 months at $4\frac{3}{4}$%?

20. \$1261.45 from March 27, 1893, to Jan. 13, 1895, at 6%?

Find the amount of:

21. \$800 for 2 years at 5%.

22. \$372 for 1 year 8 months at 6%.

23. \$755.50 for 2 years 3 months at 4%.

24. \$928 from Sept. 1, 1890, to June 1, 1891, at 5%,

25. \$1140 from Feb. 1, 1891, to July 4, 1891, at $3\frac{1}{2}$%?

26. \$1785 from April 9, 1884, to April 1, 1895, at 4%.

27. \$366.20 from May 22, 1884, to June 28, 1886, at $6\frac{1}{2}$%.

28. \$1.00 from July 12, 1882, to July 22, 1886, at 7%.

29. \$27.70 for 1 year 135 days at $5\frac{1}{2}$%.

30. \$615.60 from August 9, 1880, to Nov. 19, 1882, at 6%.

EXAMINATION PAPER. No. 6.

(TIME, 1 HOUR. VALUE OF EACH QUESTION, 10).

1. Divide a dollar between two boys so that one will have $\frac{9}{10}$ of what the other has.

2. If 200 men can lay 3 miles of railway in 27 days, in how many days will 300 men lay 5 miles of railway?

3. If 1T 10 cwt. 59 lb. cost $35, what will 8 cwt. 74 lb. cost?

4. What is the value of the oil in a rectangular tank 1.4^{m} long, 1.2^{m} wide and 2.5^{m} deep, at 3 cents per liter?

5. $5 was paid for insuring a barn at $\frac{2}{3}\%$. For what sum was the barn insured?

6. A farmer sent an agent grain and roots which the agent sold for $1463.68, charging a commission of 5%. With the proceeds the agent, who was a stock fancier, was directed to buy thoroughbred Durhams which had just landed, deducting his own commission of 3%. How many animals, at an average price of $50 each, did he buy?

7. What is the interest of $86.40 for 4 years at 5%.

8. A merchant who sold goods at an average profit of 12% made a profit of $2814 in a year. What was the amount of his sales in the year?

9. A broker received $15.39 for selling $684 worth of stock. What was the rate of his commission?

10. Find the interest of $500 at 6% from Sept. 11, 1895, to Dec. 25, 1896.

COMPOUND INTEREST.

36. *Compound Interest* is interest not only on the *principal* but also on all the *interest* which becomes due.

Interest is generally compounded annually, but it may be compounded semi-annually, quarterly etc., by agreement.

Although compound interest is very often reckoned on money lent or on other debts, such interest cannot be legally collected unless the agreement distinctly states that the interest is to be compounded.

EXAMPLE 33. What is the compound interest of $350 for 3 years at 6%?

$350	
.06	
$21.00	Interest for 1st year.
350	
$371	Amount, also principal for 2nd year.
.06	
$22.26	Interest for 2nd year.
371	
$393.26	Amount, also principal for 3rd year.
.06	
$23.5956	Interest for 3rd year.
393.26	
$416.8556	Amount for 3 years.
350	Original principal.
$66.85+	Compound interest for 3 years.

Or,
$$
\begin{array}{r}
\$350 \\
1.06 \\
\hline
2100 \\
350 \\
\hline
371.00 \\
1.06 \\
\hline
222600 \\
37100 \\
\hline
393.26 \\
1.06 \\
\hline
235956 \\
39326 \\
\hline
416.8556 \\
350 \\
\hline
\$66.85+ \quad \text{Ans.}
\end{array}
$$

EXERCISE XXIII.

Find the compound interest of :

1. \$500 for 3 years at 5%.
2. \$250 for 3 years at 6%.
3. \$1000 for 4 years at 4%.
4. \$174.50 for 2 years at 6%.
5. \$27.50 for 4 years at 5%.
6. \$220 for 4 years at 7%.
7. \$600 for 5 years at 6%.
8. \$93.80 for 3 years at $4\frac{1}{2}$%.
9. \$750 for $1\frac{1}{2}$ years at 6%, interest payable half-yearly.

Interest for ½ year at 6% = interest for 1 year at 3%.
Hence, as there are 3 *half-years* at 6% we compute as for 3 *years* at 3%.

$750
1.03
2250
750
772.50
1.03
231750
77250
795.675
1.03
2387025
795675
819.545 Amount for 1½ years.
750
$69.545 Comp. interest.

10. $320 for 2 years at 6%, interest payable half-yearly.

11. $156 for 1 year and 3 months at 4%, interest quarterly.

12. $85.40 for $2\frac{1}{2}$ years at 5%.

13. $600 for $1\frac{1}{2}$ years at 4%, interest half-yearly.

14. $550 from August 1, 1880 to Aug. 1, 1883, at 6%.

15. $420 from May 16, 1890 to Jan. 7, 1893, at 6%.

Time = 2 years 236 days.

Interest of $1 for 236 days at 6% = $.06 × $\frac{236}{365}$ = $.039.

$420
1.06 amt. of $1 for 1 year.
2520
420
445.20
1.06
267120
44520
471.912
1.039 amt. of $1 for 236 days.
4247208
1415736
471912
$490.32 amount.
420
$70.32 interest.

16. $1000 from Sept. 18, 1893, to Feb. 11, 1896, at 5%.

17. $175 from Nov. 12, 1890, to May 3, 1893, at 6%.

18. $360 from March 25, 1894, to Dec. 15, 1895, at 7%.

$500. HALIFAX, Sept. 15, '92.

On demand, for value received, I promise to pay George Cunningham, or order, the sum of five hundred dollars, with interest at 6%.

PERCY BUTLER.

19. Note paid April 3, '95. Find amount at compound interest.

20. On a note for $486.50 given April 25, 1890, at 6%, $86.50 was paid Jan. 1, 1891, $150 on June 18, 1891, and the balance March 1, 1892. What was the amount of the last payment?

Find amount of $486.50 from April 25, to Jan. 1. Deduct payment made. Then find amount of remainder from Jan. 1, to June 18, and deduct payment made. Then amount of remainder to March 1.

21 A note dated May 10, 1892, for $740 was indorsed as follows: Aug. 19, 1892, $40; Nov. 27, 1892, $200, and March 7, 1893, $150. What amount was due when the note was paid July 15, 1893, interest at 5%?

PROBLEMS IN SIMPLE INTEREST.

37. Of the *principal*, *time*, *rate* and *interest*, when any three are given the fourth can be found.

TO FIND THE RATE.

38. ORAL.—What is the rate per cent.:

1. When the interest of $100 for 1 year is $6?
2. When the interest of $300 for 1 year is $15?
3. When the interest of $200 for 2 years is $28?

EXAMPLE 34. What is the rate per cent. when the interest of $387 for 3 years is $81.27?

Interest on $387 for 1 year $= \frac{\$81.27}{3}$

" " $1 " " $= \frac{\$81.27}{3 \times 387}$

" " $100 " " $= \frac{\$81.27 \times 100}{3 \times 387} = \$7$ or 7 per cent.

EXERCISE XXIV.

What is the rate per cent. when the interest of:

1. \$910 for 3 years is \$163.80?
2. \$185 for 4 years is \$40.70?
3. \$640 for $3\frac{1}{4}$ years is \$93.60?
4. \$485 for 6 years is \$151.32?
5. \$800 for $2\frac{1}{4}$ years is \$85.50?
6. \$87.50 for 4 years is \$28?
7. \$56.75 for 6 years is \$13.62?
8. \$131.40 for $4\frac{1}{2}$ years is \$30.24?
9. \$378.40 from March 1 to Nov. 2 of the same year is \$17.86?
10. What is the rate per cent. when \$600 amounts to \$612.60 in 146 days?

To Find the Time.

39. Example 35. In what time will \$825, at 6%, produce \$67.81?

Interest of \$825 for 1 year, at 6%, is \$49.50.

Time to produce \$49.50 = 1 year.

" " \$1 $= \frac{1 \text{ year}}{49.50}$

" " \$67.81 $= \frac{1 \text{ year} \times 67.81}{49.50} =$ 1 year 135 days.

EXERCISE XXV.

In what time will:

1. \$625 produce \$100 interest, at 4%?
2. \$265 produce \$39.75 interest, at 5%?
3. \$144.80 produce \$25.34 interest, at 5%?
4. \$1250 produce \$225 interest, at 4%?
5. \$840 produce \$196.56 interest, at $6\frac{1}{2}$%?
6. \$962 amount to \$1197.69, at 7%?
7. \$348 amount to \$434.13, at $5\frac{1}{2}$%?

8. \$267.60 amount to \$325.58, at $6\frac{2}{3}\%$?

9. \$615 amount to \$631.85, at 4%?

10. \$5266 produce \$131.65 interest, at 5%?

TO FIND THE PRINCIPAL.

40. EXAMPLE 36. What principal will yield \$23.10 interest from April 1, 1894, to January 18, 1895, at $5\frac{1}{4}\%$?

Time = 292 days.

Principal to give:

\$ 5.25 in 1 year (365 days) = \$100

\$ 1.00 " " $= \frac{\$100}{5.25}$

\$ 1.00 in 1 day $= \frac{\$100 \times 365}{5.25}$

\$23.10 " $= \frac{\$100 \times 365 \times 23.10}{5.25}$

\$23.10 in 292 days $= \frac{\$100 \times 365 \times 23.10}{5.25 \times 292} = \$550.$

EXERCISE XXVI.

What principal will give:

1. \$129 interest in 3 years, 5%?

2. \$174.15 interest in $4\frac{1}{2}$ years, at 6%?

3. \$370.65 interest in 4 years, at $5\frac{1}{4}\%$?

4. \$117.50 interest in 3 months, at 8%?

5. \$16.90 interest from August 15 to the end of the year, at 5%?

6. \$40.50 interest in 9 months, at $6\frac{3}{4}\%$?

7. An amount of \$376.05 in 3 years, at 5%?

Amount of \$100 for 3 years, at 5% = \$115

Principal, which amounts to \$115 in 3 years, at 5% = \$100

" " " \$1 " " $= \frac{\$100}{115}$

" " " \$376.05 " " $= \frac{\$100 \times 376.05}{115} = \$327$

8. An amount of \$345.60 in 4 years, at 5%?

9. An amount of \$539.40 in 6 years, at 4%?

10. An amount of \$481.31 in $4\frac{1}{2}$ years, at $5\frac{1}{2}\%$?

BANK DISCOUNT.

41. EXAMPLE 37. John Brown wishes to borrow about $150 for 90 days. He goes to James Smith, whose credit is good, and writes the note given below, which James Smith endorses by writing his name across the back.

$150. Halifax, June 10, 1894.

Ninety days after date, for value received, I promise to pay James Smith, or order, at the Union Bank, Halifax, the sum of one hundred fifty dollars.

JOHN BROWN.

Mr. Brown then carries this note to the Union Bank where they deduct the *bank discount* at 6% from the *face value* of the note and give him the *proceeds*.

As the note cannot be collected by legal process until 3 days after the time specified in the note expires, 3 days, called *days of grace*, are added.

The interest of $150 at 6% for the *term of discount* or 93 days is then calculated. This interest, $2.30, called the *bank discount*, is retained by the bank. It is subtracted from the $150 or *face value* of the note and the balance, $147.70, called the *proceeds* or *avails* of the note is given to Mr. Brown.

On Sept. 11, 93 days after June 10, the note *matures* and Mr. Brown must pay the Union Bank $150. If he fails to do so the note must be redeemed by Mr. Smith.

If the note should be paid at the New Glasgow branch instead of at Halifax a small percentage called *exchange* would be charged.

EXAMPLE 38. Paul Jones bought a horse from H. D. Macdonald for $120. As Mr. Jones was unable to pay for the horse for 4 months he gave Mr. McDonald his note for $120 with interest at 6% as below.

$120. New Glasgow, Aug. 20, 1894.

Four months after date I promise to pay H. D. Macdonald, or order, the sum of one hundred twenty dollars, for value received, with interest at 6%.

PAUL JONES.

On Oct. 24 Mr. Macdonald needed the money and he took Mr. Jones' note to the Bank of Nova Scotia. Here he endorsed* it,

*Unless Mr. Jones were a well-known citizen of the place Mr. Macdonald would probably be required to write "Protest and presentation waived" above his indorsement.

which made him responsible to the bank for the amount in case Mr. Jones failed to meet his obligation when the note matured. He then received what the note would be worth on the date of its maturity, less the bank discount at 7%. Find the *bank discount* and the *proceeds*.

Solution: The note matures on Dec. 23.

Amount of \$120 for the 4 months and 3 days (125 days) at 6% = \$122.47 = the amount which Mr. Jones must pay to the holder of his note when the note matures.

The bank discounted this \$122.47 on Oct. 24, or 60 days before the note was due.

Interest of \$122.47 for 60 days at 7% = \$1.41 = bank discount.

Proceeds = \$122.47 − \$1.41 = \$121.06.

EXERCISE XXVII.

1. \$175. St. John, July 18, 1894.

Ninety days after date, for value received, I promise to pay J. C. MacIntosh, or order, at the Bank of New Brunswick here, the sum of one hundred seventy-five dollars.

JAMES LOGAN.

Discounted at 6% the day it was drawn, July 18th. Find bank discount and proceeds.

2. \$300. Halifax, June 18, 1894.

Four months after date, for value received, we jointly and severally promise to pay to the order of W. H. Schwartz & Sons, at the Merchants Bank here, the sum of three hundred dollars. JAMES CHISHOLM.

JOHN GRANT.

Discounted at Pictou July 13, at 7% and $\frac{1}{8}$% exchange. Find bank discount and proceeds.

3. \$250. Truro, Sept. 20, 1894.

Sixty days after date, for value received, I promise to pay Neil Ross, or order, the sum of two hundred fifty dollars, with interest at 5 per cent.

SIMON A. CAMPBELL.

Discounted at agency of Bank of Nova Scotia Oct. 3, at 7%. Find bank discount and proceeds.

Find the date of maturity, the term of discount, the bank discount and the proceeds in each of the following notes:

	Face of Note.	Date.	Time.	Date of Discount.	Rate of Discount.
4.	$750	June 10, 1894	90 da.	June 23	6%.
5.	$500	Jan. 7, 1890	60 da.	Jan. 7	7%.
6.	$250	Sept. 1, 1894	4 mo.	Nov. 1	6%.
7.	$310	April 3, 1894	90 da.	May 16	7%.
8.	$625.	Mar. 2, 1884	3 mo.	Mar. 2	7%
9.	$160	Feb. 5, 1888	60 da.	Feb. 5	6%
10.	$1000	Oct. 21, 1894	90 da.	Dec. 1	7%

PROPORTIONAL PARTS.

42. ORAL.

1. Divide 15 oranges between A and B so that for every 2 that A receives, B will receive 3.

2. John and William went fishing. For every 2 trout that John caught, William caught 5. They caught 32 altogether. How many did each get?

EXAMPLE 39. Divide $360 among A, B and C, in the proportion of 2, 3 and 5.

$$2+3+5 = 10$$
$$\$360 \div 10 = \$36$$
$$\$36 \times 2 = \$72 = \text{A's share.}$$
$$\$36 \times 3 = \$108 = \text{B's ``}$$
$$\$36 \times 5 = \$180 = \text{C's ``}$$

In the division of the $360 A gets 2 shares, B 3 and C 5, which makes 10 shares in all. $360 divided into 10 shares makes the value of 1 share $36.

EXERCISE XXVIII.

1. Divide $2800 among A, B and C in the proportion of 3, 5 and 6.

2. The sides of a triangle are in the proportion of 6, 7 and 8. The sum of the sides is 420. What is each side?

3. Carbonic Acid is made of 32 parts by weight of oxygen to 12 parts by weight of carbon. How many lbs. of oxygen in 220 lbs. of carbonic acid?

4. Gunpowder is composed of saltpetre, sulphur and charcoal, in the proportion of 75, 10 and 15. How many pounds of saltpetre in 24 cwt. of gunpowder?

5. Divide $550 among three persons so that as often as the first receives $7 the second will receive $8 and the third will receive $10.

6. In a certain city of 82205 inhabitants there are 21 females to every 20 males. How many females are there?

7. A can do $1\frac{1}{2}$ times as much work in a day as B, and B can do $1\frac{1}{2}$ times as much as C. They labor at a piece of work for a certain time and receive \$70.11 in payment. How much does each receive when the money is divided?

8. Divide \$1800 among A, B and C so that B will have twice as much as C, and A will have as much as B and C together.

9. Divide \$2800 among a child, a woman and a man, so that the child will get half as much as the woman and the woman half as much as the man.

10. Divide \$26.52 in the proportion of $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$.

PARTNERSHIP.

43. When two or more persons join together to carry on a business the connection formed is called a *Partnership.*

EXAMPLE 40. A, B and C form a partnership. A puts in $900, B $1000 and C $1200. They gain $620. What is each man's share of the gain?

$900 + $1000 + $1200 = $3100.
A's share = $\frac{900}{3100}$ of $620 = $180.
B's " = $\frac{1000}{3100}$ of $620 = $200.
C's " = $\frac{1200}{3100}$ of $620 = $240.

The total capital is $3100. Since A provides $\frac{900}{3100}$ of it, he must receive $\frac{900}{3100}$ of the gain.

EXERCISE XXIX.

1. A, B and C engage in trade. A puts in $800, B puts in $1100 and C puts in $1400. What will be the share of each if they gain $1320?

2. A, B and C form a partnership, and they purchase a ship. A furnished $9000, B $6000 and C $3000. In a certain time the ship earned $4500. What part of this sum should each receive?

3. X, Y and Z trade in company. X puts in $250, Y $750 and Z $500. At the end of nine months they find they have lost $472.50. What is each man's share of the loss?

4. A, B, C and D agree to cut 500 cords of wood for $300. A cuts 125 cords, B 100 cords, C 150 cords and D the rest. How much of the $300 should each receive?

5. Three men hire a pasture for the summer. A pastures 20 cows, B pastures 25 and C pastures 35. What ought each to pay if the rent of the pasture is $30?

6. A gentleman in his will left his wife $2700, his son $1800 and his daughter $1600. After his death, it was found that his estate was only worth $3050. How much did each receive?

PARTNERSHIP ON TIME.

44. EXAMPLE 41. A, B and C traded in furs. A put in \$750 for 10 months, B put in \$375 for 12 months and C put in \$1125 for 16 months. They gained \$1720. What was each man's share of the gain?

\$750 for 10 months = \$7500 for 1 month.
\$375 " 12 " = \$4500 " 1 "
\$1125 " 16 " = \$18000 " 1 "

All the capital invested = \$30000 for 1 month.

A's share of gain = $\frac{7500}{30000}$ of \$1720 = \$430.
B's " = $\frac{4500}{30000}$ of \$1720 = \$258.
C's " " = $\frac{18000}{30000}$ of \$1720 = \$1032.

EXERCISE XXX.

1. A, B and C form a company. A puts in \$700 for 5 months, B puts in \$800 for 6 months and C puts in \$500 for 10 months. They gain \$399. What is each man's share of the gain?

2. A, B and C hired a pasture for \$99. A put in 22 cows for 6 months, B put in 24 cows for 5 months and C put in 36 cows for 4 months. What ought each man to pay?

3. A, B and C built a house. A worked at it 40 days, and valued his labor at \$2.50 a day; B worked at it 50 days, and valued his labor at \$3 a day; C put in \$400 cash. They sold the house for \$975. What should each receive?

4. A, B and C trade together in cattle. A puts in \$300 for 7 months, B \$500 for 8 months and C \$200 for 12 months. They gain \$170. What is each man's share of the gain?

5. Four farmers contract to build a piece of road for \$3430. The first sends 10 men to work for 20 days, the second sends 12 men to work for 15 days, the third sends 15 men to work for 16 days and the fourth sends 20 men to work 18 days. What should each farmer receive?

SQUARE ROOT.

45. A *Power* of a number is the product obtained by multiplying the number by itself one or more times.

Thus: 16 is the second power of 4, for $4 \times 4 = 16$.
64 is the third power of 4, for $4 \times 4 \times 4 = 64$.

46. A small figure written above a number and to the right indicates the power to which the number is to be raised; thus: $3^2 = 3 \times 3 = 9$; $3^3 = 3 \times 3 \times 3 = 27$; $3^4 = 3 \times 3 \times 3 \times 3 = 81$.

47. The second power of a number is called the square of the number, and the third power is called the cube of the number.

What are the following equal to:

5^2? 5^3? 3^4? $(\frac{1}{2})^2$? 6^2? 6^3? $.04^2$?

48. The *Square Root* of a number is one of its two equal factors. Since $4 \times 4 = 16$, the square root of 16 is 4. What is the square root of 4? 9? 25? 36? 49? 64? 81? 100? 121? 144? 400? 10000? $\frac{1}{4}$? $\frac{4}{9}$?

49. The symbol $\surd$ denotes that the square root of the expression before which it is written, is to be taken. It is sometimes written $\sqrt[2]{}$. Thus, $\surd 36 = 6$.

The square of every whole number has twice as many digits as the number, or one less than twice as many.

50. The square of the sum of two numbers is equal to the square of the first number plus twice the product of the first and second plus the square of the second.

$$64^2 = (60 + 4)^2 = 60^2 + \text{twice } 60 \times 4 + 4^2 = 4096.$$

EXAMPLE 42. Find the square root of 4096;

$\surd 4096 = 60 + 4 = 64$

$3600 = 60^2$

496

$(60 \times 2 + 4) \times 4 = 496 = \text{twice } 60 \times 4 + 4^2$.

Or

	4096	64 Ans.
	36	
	496	
124	496	

Example 43. What is the square root of 576?

```
  5|76   24 Ans.
  4
 ---
  176
44 176
 ---
```

We mark off the digits in periods of two each, counting from the right. As we cannot find an exact square root of 5 we take the nearest square root which is 2. We write 2 as the first figure of the required root and place 4, the square of 2, under the 5 and subtract. We then annex the next period, 76, to the remainder for a dividend. We multiply the 2 of the root by 2 and obtain 4, which we set down to the left for the first figure of a divisor. Observe that the 2 of the root is two tens or 20 and that the four of the trial divisor is 4 tens or 40. 176 divided by 40 goes 4 times. We place a 4 in the root and a four to the right of the 4 which is the trial divisor. The trial divisor is now 44. We multiply the 44 by the four in the root and place the product, 176, under the last remainder.

EXERCISE XXXI.

Find the square root of:

1. 256.	4. 529.	7. 5625.	10. 4624.
2. 289.	5. 784.	8. 2401.	11. 7569.
3. 361.	6. 2025.	9. 3249.	12. 8836.

Example 44. Find the square root of 93636.

```
  9|36|36(  306 Ans.
  9
 ---
  3636
606 3636
 ---
```

After finding the first figure of the root and subtracting its square from the left hand period we bring down the next period, 36, as before. We multiply 3, the first figure of the root, by 2 and put the product 6 to the left. Now if we put any figure greater than 0 in the root and to right of the 6, for a trial divisor, we shall find that the trial divisor is too large, we therefore put 0 in the root and to the right of the 6 and then bring down the next period. We now have 60 for a trial divisor and we try 6 for the root. We place the 6 to the right of the 60 and multiply the 606 by 6 which gives 3636.

EXERCISE XXXII.

Find the square root of:

1. 262144.	5. 9647236.	9. 152899025.
2. 205209.	6. 25080064.	10. 550183936.
3. 81796.	7. 964723600.	11. 3600840049.
4. 315844.	8. 23804641.	12. 110250000.

EXAMPLE 45. Find the square root of 160.7 to three places of decimals.

	1|60.70|00|00(	12.676 + Ans.
	1	
	60	
22	44	
	1670	As we require three decimal places in the root we must have double that number of decimal places in the number whose root is to be extracted; we therefore annex five noughts to the 7.
246	1476	
	19400	
2527	17689	
	171100	
25346	152076	

51. To extract the square root of a decimal we must make the number of decimal places an even number and proceed as in whole numbers. The decimal point is to be put in the root as soon as the tenths and hundredths are brought down.

EXERCISE XXXIII.

Find, to four places of decimals, the square root of:

1. 6.94.	**7.** 3.	**13.** 10.36.
2. 18.7.	**8.** 126.041.	**14.** 1074.9.
3. .17572864.	**9.** .001.	**15.** 46.
4. .0015625.	**10.** .1.	**16.** 87.5.
5. .00001296.	**11.** .00005.	**17.** 1.1.
6. 2.	**12.** 63.841.	**18.** .045.

52. To extract the square root of a common fraction we extract the square root of the numerator and denominator. Thus, the square root of $\frac{9}{16} = \frac{3}{4}$.

When the terms of the fraction are such that an exact square root cannot be found, the fraction may be reduced to a decimal and the square root of the decimal extracted.

APPLICATION OF THE SQUARE ROOT.

The teacher should see that the pupils do the work in drawing indicated, and other exercises of a like character. Pupils should be taught to draw to a scale.

53. An *Angle* is the opening between two lines that meet.

54. A *Right Angle* is an angle such that if one of the sides be produced beyond the point where the two lines meet another angle will be formed which will be equal to the first.

55. A *Triangle* is a figure having three sides and three angles.

56. When one of the angles of a triangle is a right angle the triangle is called a *Right-Angled Triangle.* In a right-angled triangle the side *opposite* the right angle is called the *Hypotenuse.* Either one of the two sides which make the right angle may be called the *Base.* The other side will be then called the *Perpendicular.*

Draw a right-angled triangle whose base is 4 inches and perpendicular 3 inches. How many inches in the hypotenuse?

Find the sum of the squares of the base and perpendicular and take the square root; thus, $4^2 + 3^2 = 16 + 9 = 25$; $\sqrt{25} = 5$.

Draw several right-angled triangles having base and perpendicular of various lengths and measure hypotenuse. Then square the sides about the right angle and take the square root of the sum. Compare the result with the length of the hypotenuse found by actual measurement.

57. To find the hypotenuse of a right-angled triangle when the two sides about the right angle (the base and perpendicular) are given: Add the squares of the two sides and extract the square root of the sum.

58. When the hypotenuse and one of the sides are given to find the other: Subtract the square of the given side from the square of the hypotenuse and extract the square root of the difference.

EXERCISE XXXIV.

1. The base of a right angled-triangle is 60 feet and the perpendicular 80. What is the hypotenuse?

2. The hypotenuse of a right angled triangle is 160 feet and the base is 128 feet. What is the perpendicular?

3. The floor of a room is 84 feet long and 63 feet wide. What is the distance from one corner of the room to the opposite corner?

4. A ladder 35 feet long reaches to the top of a chimney. The foot of the ladder is 16 feet from the bottom of the chimney. How high is the chimney?

5. A man walked 200 yards due north and then walked due east 300 yards. How far in a straight line was he from where he started?

6. A ship sailed 50 miles due south and then sailed 80 miles due west. How far was she from her starting point?

7. A window in a burning house is forty-five feet high. How long must the ladder be to reach the window from the opposite side of the street, the street being 60 feet wide?

8. The floor of an assembly hall is 70 feet long and 55 feet wide. How long will the line be that will divide the floor into two right-angled triangles?

MEASUREMENT OF AREA.

59. *Any* four-sided figure is called a *Quadrilateral.* A *Rectangle* is a four-side figure having all its angles right angles.

Draw a rectangle 8 inches long and 5 inches wide. Divide the two longer sides into spaces of an inch each and join the opposite points of division. Divide the two shorter lines the same way and join the opposite points of division. How many small squares are in the rectangle? What size is each?

How many square inches in a rectangle 8 inches long and 5 inches wide?

60. To find the area of a rectangle: Multiply the length by the breadth.

EXAMPLE 46. How many square yards in a floor 16 feet 4 inches by 15 feet 8 inches?

$$\frac{16\frac{1}{3} \times 15\frac{2}{3}}{9} = \frac{49}{3} \times \frac{47}{3} \times \frac{1}{9} = 28\frac{35}{81} \text{ square yards.}$$

EXERCISE XXXV.

1. How many square yards in a ceiling 14 feet 9 inches by 13 feet 6 inches?

2. What will it cost to plaster a ceiling 18 feet 9 inches by 16 feet 8 inches, at \$0.75 a square yard?

3. What will be the cost of painting the walls of a flat roofed house 30 feet front, 40 feet deep, and 25 feet high at \$0.15 a square yard?

4. A playground is 46.5 meters long and [illegible] rs wide. What will be the cost of rolling it for games at 45 cents an ar?

5. The area of a room is 600 feet and its length is 25 feet. What is its width?

EXAMPLE 47. What will it cost to carpet a room 14 ft. 2 in. by 12 ft. 10 in. with carpet 27 in. wide and $1.10 a yard?

170×154 = area of floor in sq. in.

36×27 = area of 1 yd. of carpet in sq. in.

$\frac{170 \times 154}{36 \times 27}$ = number of yards of carpet required.

$\frac{170 \times 154 \times \$1.10}{36 \times 27} = \$29.62+$.

EXERCISE XXXVI.

1. What will it cost to carpet the floor of a room 18 ft. 9 in. long and 17 ft. 8 in. wide with carpet 30 in. wide and 90 cents a yard?

2. How much will it cost to carpet a room 12 ft. 4 in. long and 11 ft. 8 in. wide with carpet 27 in. wide and $1.15 a yard?

3. What will be the cost of covering a floor 20 yards long and 18 yds. 2 ft. wide with linoleum 36 inches wide and $1.05 a yard?

4. A floor is completely covered with mats 3 ft. 6 in. long and 2 ft. 8 in. wide and worth $1 apiece. What is the value of the lot, the floor being 17 yds. by 15 yds. $2\frac{1}{2}$ ft.?

5. A cellar floor 24 ft. 6 in. by 20 ft. 8 in. is covered with tiles, each 8 in. by 5 in. and worth $0.30 a dozen. What is their value?

NOTE.—Since the width of a room is frequently not a multiple of the width of the carpet, it is usually necessary to purchase more carpet than will exactly cover a floor. Waste also occurs in cutting the carpet "to match."

ORAL.

1. What kind of a figure is the wall of a room? If the four walls of a room were placed in a straight line, end to end, what figure would they make?

2. Draw a diagram of one of the longer walls of a room 15 ft. long, 14 ft. wide and 10 ft. high. Now extend the diagram to represent the four walls spread out in the same plane. What is the length of the rectangle that they make? What is its width?

3. What figure would a roll of paper 20 in. wide and $7\frac{1}{2}$ yds. long make if spread out over a level surface?

4. Draw such a rectangle in one corner of the diagram you have made of the walls of the room. How would you find how many such rolls would cover the walls of the room?

5. It will be observed that in the following exercises no note is taken of doors or windows.

EXAMPLE 48. What would be the cost of paper for the walls of a room 16 ft. 8 in. long, 15 ft. 6 in. wide and 10 ft. 6 in. high, with paper 18 in. wide, 8 yds. in a roll and 20 cents a roll?

$16\frac{8}{12} + 16\frac{8}{12} + 15\frac{6}{12} + 15\frac{6}{12} = 64\frac{1}{3}$ ft.

$64\frac{1}{3} \times 10\frac{1}{2}$ = Area of walls in sq. ft.

$1\frac{1}{2} \times 24$ = " 1 roll of paper in sq. ft.

$\frac{64\frac{1}{3} \times 10\frac{1}{2}}{1\frac{1}{2} \times 24}$ = Number of rolls.

$\frac{64\frac{1}{3} \times 10\frac{1}{2} \times .20}{1\frac{1}{2} \times 24} = \$3.75+.$

EXERCISE XXXVII.

1. How much must be paid for paper for the walls of a room 18 feet long, 16 feet 10 inches wide and 12 feet high, the paper being 20 inches wide, 7 yards in a roll and 21 cents a roll?

2. If paper 18 inches wide and 8 yards in a roll is worth 25 cents, what will it cost to cover the walls of a room 12 feet 5 inches by 11 feet 8 inches and 9 feet 8 inches high?

3. A room 3 yards 1 foot long, 3 yards wide and 3 yards 6 inches high is covered with paper @ 30 cents a roll. What did it cost if the paper was 20 inches wide and $7\frac{1}{2}$ yards in a roll?

4. What will it cost to paper the walls of a room 19 feet long, 17 feet wide, and 16 feet high with paper 18 inches wide, 7 yards in a roll and 60 cents a roll?

5. What will be the cost of painting the walls of a room 18 feet 6 inches long, 15 feet wide and 11 feet 6 inches high, at \$0.65 a square yard?

6. What will it cost to whitewash the ceiling and walls of a room 20 feet long, 18 feet wide and 14 feet high, at 20 cents a square yard?

7. A dining hall is 10.6 meters long, 9.8 meters wide and 4.9 meters high. What would be the cost of papering it with paper .5 of a meter wide, 6 meters in a roll and $0.35 a roll?

62. The *Altitude* of a triangle is a perpendicular drawn from any angle to the opposite side or the opposite side produced.

Draw a triangle of three unequal sides. Measure lengths of its three different altitudes.

When a side of a triangle is also its altitude, what kind of a triangle do you call it?

The side of a triangle on which a perpendicular is let fall from an opposite angle is usually called the base.

Draw a right-angled triangle, making the sides that are about the right angle 8 inches and 6 inches respectively.

If you multiply the 8 by the 6 do you get the area of the right-angled triangle? Of what figure do you get the area? How much larger is the rectangle, of which 8 and 6 are two sides, than the triangle?

Draw another triangle with none of its angles a right angle. Draw one of its altitudes. If you multiply the altitude by the base do you get the area of the triangle? How many times the area of the triangle do you get?

63. The *Area* of a triangle is half the product of its altitude and base.

EXERCISE XXXVIII.

1. The base of a triangle is 80 feet and a perpendicular let fall on it from the opposite angle is 25 feet. What is its area?

2. One side of a three-cornered field is 460 yards and a line run at right angles to it from the opposite corner is 200 yards. How many acres in the field?

3. Find the area of a triangle whose base is 60 yards and the perpendicular on it from the opposite angle 10.25 yards.

4. How many acres in a triangular field whose base and altitude are respectively 900 and 400 yards?

5. The area of a triangle is 11200 square yards and its altitude 140 yards. What is the base?

64. *Parallel Lines* are lines that run in the same direction, but never approach each other. The lines on a sheet of writing paper are parallel.

65. A *Parallelogram* is a four-sided figure whose opposite sides are parallel.

Every rectangle is a parallelogram. Is every parallelogram a rectangle? Draw a parallelogram that is not a rectangle.

66. The *Altitude* of a parallelogram is a perpendicular drawn from any point in one of its sides to the opposite side. The side on which the perpendicular falls is called the base.

67. The area of a parallelogram is equal to the product of the altitude and base.

EXERCISE XXXIX.

1. What is the area of a parallelogram whose base is 300 feet and altitude 250 feet?

2. How many square yards in a parallelogram whose base is 30 feet and altitude 27 feet?

3. The length of a piece of road is 2000 yards and its width is 25 feet. How many blocks 8 in. by 5 in. will pave it?

4. Draw and find the area of a rectangle each side of which will be $5\frac{1}{2}$ inches.

What name do you give to such a rectangle?

5. One side of a farm that forms a parallelogram is 600 yards and the shortest distance to the opposite side is 400 yards. How much is the farm worth at $30.25 an acre?

68. A *Trapezoid* is a four-sided figure, having only two of its sides parallel. The perpendicular between the parallel sides is the altitude of the trapezoid. Draw a trapezoid having its parallel sides 5 inches and 8 inches, respectively, and its altitude 4 inches.

EXAMPLE 49. What is the area of a trapezoid whose parallel sides are, respectively, 16 feet and 20 feet and whose altitude is 10 feet?

$$\frac{16+20}{2} \times 10 = 180 \text{ sq. ft.}$$

69. To find the area of a trapezoid, multiply half the sum of the parallel sides by the altitude.

EXERCISE XL.

1. What is the area of a trapezoid whose parallel sides are 20 and 30 feet, respectively, and altitude 16 feet?

2. Find the area of a trapezoid whose parallel sides are, respectively, 28 and 32 feet and whose altitude is 16 feet 8 inches.

3. A lot of land that is 120 feet deep measures 80 feet fronting on the street and 40 feet in the rear. What is it worth at $1.50 a square yard?

4. Two sides of a four-sided field are parallel and they measure 300 and 400 yards, respectively. The distance between the parallel sides is 320 yards. How much is the field worth at $60 an acre?

5. What fraction of an acre in a paddock in the form of a trapezoid whose parallel sides are 160 and 240 feet, the distance between them being 200 feet?

NOTE.—The area of any plane figure bounded by straight lines can be found by dividing it into triangles and finding the area of each triangle and adding the results.

MEASUREMENT OF THE CIRCLE.

70. A *Circle* is a plane figure bounded by a curved line every part of which is equally distant from a point within the figure, called the centre.

71. The curved line is called the *Circumference* or *Periphery* of the circle.

72. Any line drawn from the centre to the circumference is called a *Radius* (plural, Radii).

73. A line drawn through the centre of the circle and terminated at each end by the circumference is called a *Diameter*.

Draw a circle. Draw a diameter. Draw a radius. How many diameters can be drawn in the same circle? The diameters of the same circle are all ——? How many radii can be drawn? How do the radii and diameters compare in length?

EXAMPLE 50. What is the circumference of a circle whose diameter is 15 feet?

15 feet $\times$ 3.1416 = 47.1240 ft.

74. To find the circumference of a circle, multiply the diameter by 3.1416.

When less accuracy is required, it will do to multiply by $3\frac{1}{7}$.

EXERCISE XLI.

1. Find the circumference of a circle whose diameter is 80 feet.

2. The radius of a circle is 15 feet. What is its circumference?

3. The greatest distance across a circular race course is 310 yards. What is the length around?

4. The circumference of a circle is 1570.8 feet. What is its diameter?

5. The circumference of a circle is 188.496. What is its radius?

EXAMPLE 51. What is the area of a circle whose diameter is 20 feet?

$$20^2 \times .7854 = 314.16 \text{ sq. feet.}$$

75. To find the area of a circle, square the diameter and multiply the result by .7854.

EXERCISE XLII.

1. What is the area of a circle whose diameter is 30 feet?

2. How many square meters in a circular field whose diameter is .08 of a kilometer?

3. How many square feet in a round table that is 2 feet 6 inches across?

4. The area of a circle is 31.416 yards; what is its diameter? Suggestion—Divide the area by .7854 and take the square root of the result. Why?

5. The area of a circular field is 1256.64 square rods. What is its radius?

6. The radius of a circle is 5 rods. What is its area?

7. The area of a circular fish-pond is 628.32 sq. yards. What is its diameter?

8. The diameter of a circle is 12 yards. What is its area?

9. The circumference of a circle is 125.664 feet. What is its area?

10. The area of a circle is 7854 sq. yards. What is its circumference?

MEASUREMENT OF LUMBER.

76. Lumber is sold by the Board Foot.

A board foot is 1 foot long, 1 foot wide and 1 inch thick.

A board 10 feet long, 1 foot wide and 1 inch thick, contains 10 board feet.

ORAL.—How many board feet in a board:

1. 12 feet long, 12 inches wide and 1 in. thick?
2. 18 " " 6 " " " 1 " " ?
3. 16 " " 12 " " " 2 " " ?
4. 12 " " 9 " " " 1 " " ?
5. 12 " " 9 " " " 2 " " ?

NOTE.—Board foot is sometimes called superficial foot and sometimes simply foot.

EXAMPLE 52. How many feet (board feet) in a plank 16 feet 8 in. long, 9 in. wide and 3 inches thick?

$$16\tfrac{2}{3} \times \tfrac{3}{4} \times 3 = 37\tfrac{1}{2} \text{ feet (board feet).}$$

77. To find the number of board feet in a piece of board or plank, we multiply the length in feet by the width in feet and the result by the number denoting the thickness in inches.

EXERCISE XLIII.

Find the number of board feet in each of the following:

1. 18 feet long, 8 inches wide, 3 inches thick.

2. 18 feet 4 inches long, 10 inches wide, $1\frac{1}{2}$ inches thick.

3. 17 feet 6 inches long, 1 foot 1 inch wide, 3 inches thick.

4. 13 feet 4 inches long, 1 foot 9 inches wide, $2\frac{1}{4}$ inches thick.

5. 14 feet long, 14 inches wide and $\frac{1}{2}$ inch thick. *

6. What will a plank 15 feet long, 13 inches wide and 2 inches thick cost at 3 cents a foot?

7. How many (board) feet of lumber will be required to floor a basement 20 feet long and 18 feet 9 inches wide, the plank being $2\frac{1}{2}$ inches thick?

8. What will the flooring of four rooms cost, each being 15 feet 9 inches by 14 feet 8 inches, the flooring being $1\frac{1}{2}$ inches thick and $12.00 per thousand (feet).

9. How many board feet in a squared log 40 feet long, 10 inches wide and 8 inches thick?

10. What will be the cost of the boards for a fence around a lot 100 feet long, 30 feet wide, the fence being 7 feet high, the boards being 1 inch thick and 1 cent a foot?

*Any thickness less than 1 inch is reckoned as an inch.

MEASUREMENT OF SOLIDITY OR VOLUME.

78. A *Cube* is a solid bounded by six equal squares. Draw a cube. Cut a cube from a large potato or a turnip.

Is a brick a cube? Is it a solid? How many surfaces has it? What would you call each surface? Which surfaces are the same size?

79. A *Rectangular Solid* is one that is bounded by six rectangles. Is a cube a rectangular solid? Is every rectangular solid a cube?

EXAMPLE 53. How many cubic feet in a box 3 feet 6 inches long, 2 feet 3 inches wide and 1 foot 9 inches high?

$$3\tfrac{1}{2} \times 2\tfrac{1}{4} \times 1\tfrac{3}{4} = 13\tfrac{5}{12} \text{ cubic feet.}$$

80. To find the *Volume* of a rectangular solid, multiply the product of its length and width by its height.

EXERCISE XLIV.

1. How many cubic feet in a room 12 feet 10 inches high, 14 feet long and 12 feet 6 inches wide?

2. How many cubic yards in a rectangular block of stone 5 feet 4 inches long, 4 feet broad and 3 feet high?

3. How many cords in a pile of wood 14 feet long, 10 feet high and 4 feet wide?

4. How many cubic feet of air in a room 11 feet long, 10 feet wide and 9 feet 10 inches high?

5. A stone wall is forty yards long, 6 feet high and 10 inches thick. How many cubic feet in it?

6. What will it cost to dig a cellar 20 feet in length, 8 feet in depth and 16 feet in width at $0.30 a cubic yard?

7. How many cubic yards of masonry in the walls of a cellar that is 24 feet long and 18 feet wide, measured on the outside, the walls being 7 feet 3 inches high and 1 foot 6 inches thick?

8. The walls of a foundation measured on the inside are 30 feet long and 25 feet wide. How many cubic yards in it if the walls are 7 feet high and 2 feet thick?

9. A certain cistern is 12 feet long, 9 feet wide and 10 feet deep. How many standard gallons will it hold?

10. How many liters in a cistern 3.4 meters × 2.8 meters × 2.5 meters?

81. A *Cylinder* is a round body with flat ends. The ends are circles and are parallel to each other and of the same size. An uncut lead pencil and the smoke-stack of a steamboat are cylinders. Name some other things that are cylinders. Draw a cylinder.

82. A line joining the centres of the circular ends of a cylinder is called the *Axis* of the cylinder.

83. The line drawn from one of the ends of a cylinder perpendicular to the other end is called the *Altitude* of the cylinder. When the axis and altitude of a cylinder are equal in length, it is called a *Right Cylinder*.

In an uncut lead pencil what would correspond with the altitude?

EXAMPLE 54. How many cubic feet in a cylinder the diameter of whose base (either of the circular ends) is 4 feet and whose altitude is 6 feet?

$$4^2 \times .7854 \times 6 = 75.3984 \text{ cu. ft.}$$

84. To find the volume or solidity of a cylinder, multiply the area of one of the ends by the height of the cylinder.

EXERCISE XLV.

1. How many cubic feet in a cylinder 8 feet long and 2 feet in diameter?

2. What is the solidity of a cylinder whose diameter is 10 feet and altitude 15 feet?

3. A cylindrical vessel is 10 feet 8 inches deep and 4 feet 6 inches in diameter. How many bushels will it hold?

4. A barrel made without a bulge is 2 feet 10 inches deep and 1 foot 8 inches across the head. How many bushels will it hold?

5. A steam boiler is 10 feet long and the diameter of the end is 3 feet. How many standard gallons will it hold?

85. A *Pyramid* is a solid, having for its base a triangle, a quadrilateral or any other rectilineal figure, and for its lateral surface several triangles whose vertices meet in a common point. The lateral triangles will be as many as the sides of the figure that forms the base.

86. A *Cone* is a solid, having a circle for its base and its lateral or convex surface tapering to a point, called the Vertex. Draw a pyramid and a cone.

EXAMPLE 55. What is the solidity or volume of a square pyramid the side of whose base is 5 feet and altitude 18 feet?

$5 \times 5 = 25 =$ Area of base in sq. ft.
$25 \times \frac{1}{3}$ of $18 = 150$ cu. ft. = volume of pyramid.

EXAMPLE 56. Find the volume of a cone the diameter of whose base is 5 feet and whose altitude is 18 feet.

$5^2 \times .7854 = 19.635 =$ Area of base in sq. ft.
$19.635 \times \frac{1}{3}$ of $18 = 117.81$ cu. ft. = Volume of cone.

87. To find the volume or solidity of a pyramid or cone, multiply the area of the base by one-third of the altitude.

EXERCISE XLVI.

1. What is the solidity of a pyramid the area of whose base is 63 sq. yds. and whose altitude is 21 feet?

2. How many cubic feet in a cone, the diameter of its base measuring 10 feet and its altitude being 24 feet?

3. The side of the base of a square pyramid is 8 feet and its altitude is 21 feet 9 inches. How many cubic yards in it?

4. The circumference of the base of a cone is 21.9912 feet and its altitude is 21 feet. Find its volume.

88. A *Sphere* is a solid that is perfectly round. Every point in the surface of a sphere is equidistant from a point within the sphere, called the centre. A cricket ball, a round shot and a school globe are spheres.

89. The *Diameter* of a sphere is a straight line drawn through its centre and terminated at both ends by its surface.

EXAMPLE 57. How many cubic inches in a sphere whose diameter is 15 inches?

$15^3 \times .5236 = 1767.15$ cubic inches.

90. To find the volume of a sphere, multiply the cube of the diameter by .5236.

EXERCISE XLVII.

1. How many cubic inches in a globe whose diameter is 12 inches?

2. How many cubic feet of gas in a balloon whose diameter is 36 feet?

3. What is the weight of water in a spherical vessel whose diameter is 3 feet 4 inches? (A cubic foot of water weighs about 1000 oz. av.)

EXAMINATION PAPER. No. 7.

(TIME, 1 HOUR. VALUE OF EACH QUESTION, 10).

1. Simplify $\frac{1}{2}$ of $\frac{2}{2\frac{1}{2}}$ of $\frac{13}{16} - \frac{1\frac{2}{3}}{6\frac{2}{3}}$ of $\frac{19}{20} + \frac{3}{7}$ of $\frac{6\frac{5}{12}}{3\frac{2}{3}}$.

2. Find the value of $(1.06)^3$.

3. A grocer sells cornmeal at \$3.36 a barrel, which is 20% more than it cost. What did it cost?

4. Find .08 per cent. of $\frac{3}{8}$.

5. If 2 cwt. 89 lbs. of sugar cost £3 2s. 6d., what quantity can be purchased for £21 17s. 6d.?

6. An engineer, in running a line for a piece of road, on account of a hill, has to go 400 yards in an easterly direction and then 800 yards in a northerly direction. How much longer is the road than it would be if it ran in a straight line?

7. A, B and C hire a field for \$59. A puts in 10 cows for 3 months, B puts in 8 cows for 5 months and C puts in 12 cows for 4 months. How much should each pay?

8. The radius of a circle is 5 inches. What is its circumference?

9. What is the area of the same circle?

10. A boiler is 10 feet long and the diameter of an end of it is 2 feet 6 inches. What is the weight of water it will hold? (A cubic foot of water weighs 1000 oz.)

EXAMINATION PAPER. No. 8.

(TIME, 1 HOUR. VALUE OF EACH QUESTION, 10).

1. A man invested $\frac{2}{5}$ of his capital in bank stock and $\frac{3}{4}$ of the remainder in land, and had $3000 left. What capital had he before investing?

2. A man working $9\frac{3}{4}$ hours a day finishes his mowing in 6 days. In what time would he have finished it if he had worked 13 hours a day?

3. How many bushels of wheat are necessary to sow $15\frac{1}{2}$ acres if $9\frac{3}{5}$ oz. is sown on every square rod?

4. A man divided his estate among his three sons in proportion to their ages, which were 20, 23 and 25 years. The youngest got $4000. What did each of the others get?

5. A and B were partners. A put $3000 in the business for 9 months and B put in $2400 for 6 months. They gained $1150. What was each man's share of the gain?

6. A note for $340.60, drawn on April 6th, 1894, payable in 3 months, was discounted on May 3 at 7%. What were the proceeds?

7. How much will the flooring of a cellar 30 feet long and 20 feet 6 inches wide cost, the plank being 2 inches thick and $12 a thousand?

8. What will it cost to whitewash the ceiling and walls of a room 16 feet 4 inches by 15 feet and 10 feet high, at 12 cents a square yard?

9. One side of a rectangular field that contains 3 acres is 121 rods. How many rods in the adjacent side?

10. Find the square root of 26.4 to 3 decimal places.

EXAMINATION PAPER. No. 9.

(TIME, 1 HOUR. VALUE OF EACH QUESTION, 10).

1. A grocer bought 40 lb. of tea at 20 cents a pound and 60 lb. at 30 cents a pound. At how much per lb. must he sell the mixture to gain 50% on his outlay?

2. At what rate will $300 amount to $385.50 in 4 years and 9 months?

3. A can do a piece of work in 5 days and B in 7 days. How long will it take B to finish the work after A has worked at it $2\frac{1}{2}$ days?

4. If 36 men can mow 30 acres in 12 hours, in how many hours ought 27 men to mow 20 acres?

5. Divide $4600 among A, B and C in the proportion of 6, 7 and 10.

6. What is the amount of $500 in 3 years at 6 per cent. per annum, compound interest?

7. On a lot 30 feet by 100 feet a man built a house 22 feet front and 33 feet deep. How much of the lot was unoccupied by the building?

8. Find the area of the ceiling and walls of a room 21 feet long, 20 feet wide and 11 feet 6 inches high.

9. How many liters will a cylindrical vessel hold, the diameter of its bottom being 1.3 meters and its depth being 3.5 meters?

10. The radius of a circle is 10 feet. What is its circumference?

SPECIFIC GRAVITY.

91. When a substance floats in water, we say it is lighter than water; and when it sinks, we say it is heavier than water. What we mean is that the substance is lighter or heavier than an equal volume of water.

92. The weight of a given quantity of a solid or liquid, compared with the weight of an equal bulk of water, is called its *Specific Gravity*.

If the weight of a piece of dry board or plank is only half as great as the weight of the same bulk of water, the specific gravity of the wood is .5; and if the weight of a thick plate of glass is $2\frac{1}{2}$ times greater than that of a volume of water of the same size, the specific gravity of the glass is 2.5.

93. In the metric system of weights, the *gram* is the weight of a *cubic centimeter of water*, the *kilogram* is the weight of a *cubic decimeter (liter) of water*, the *ton* is the weight of a *cubic meter of water*, etc. Hence the specific gravity of any substance is the weight of a cubic meter of it in tons, of a cubic decimeter of it in kilograms, of a cubic centimeter of it in grams, etc. And the volume of a substance in cubic meters, cubic decimeters or cubic centimeters, multiplied by its specific gravity, equals its weight in tons, kilograms or grams.

94. The specific gravity of some common substances is as follows:

Air	.001292.	Gold	19.3.
Aluminum	2.56.	Granite	2.72.
Brass (average)	7.611.	Ice	.93.
Brick, common	2.	Iron, cast	7.15.
" pressed	2.4.	" wrought	7.77.
Carbon, charcoal	1.7.	Ivory	1.91.
" graphite	2.3.	Lead	11.3.
" diamond	3.5.	Marble (average)	2.73.
Coal, soft (average)	1.25.	Mercury	13.6.
" hard "	1.5.	Milk	1.032.
Copper	8.9.	Nickel	8.8.
Cork	.29.	Oak	.84.
Deal (average)	.66.	Olive Oil	.915.
Ether	.715.	Pine, dry	.4.
Glass, crown	2.5.	Platinum	21.5.
" flint	3.33.	Porcelain	2.38.

Quartz	2.65.	Tin	7.3.
Salt	2.13.	Turpentine	.869.
Silver	10.5.	Water, sea	1.026.
Sulphur	2.5.	Zinc	7.1.
Sulphuric Acid	1.841.		

When any substance is entirely under water, it is buoyed up to the extent of the weight of the water which it displaces. Therefore, the difference of the weight of a substance in air and in water is equal to the weight of a volume of water equal to the volume of the substance.

95. Hence the specific gravity of a solid or liquid is its weight in air divided by the *difference* between its weight in air and its weight in water.

EXAMPLE 58. Find the specific gravity of a stone which weighs 21 lb. in air and 12.25 lb. in water.

21 lb. − 12.25 = 8.75 lb.
21 lb. ÷ 8.75 = 2.4 = specific gravity.

EXAMPLE 59. What is the weight of a block of granite 1.6^{m} long, 7.5^{dm} wide and 4.5^{dm} thick?

Cubic contents = $1.6^{m} \times .75^{m} \times .45^{m} = .54^{cu.\,m}$.
$.54^{cu.\,m} \times 2.72$ (sp. g. of granite) = $1.4688^{cu.\,m} = 1.4688^{t}$ or 1468.8^{Kg}.

EXERCISE XLVIII.

Find the specific gravity of:

1. A nickel plate which weighs 39.6 lb. in air and 35.1 lb. in water.

2. An ivory tusk weighing 19.1 in air and 9.1 in water.

3. Gypsum, when a piece which weighs 14.872 lb. in air weighs 8.372 lb. in water.

4. A substance which weighs 6^{Kg} in air and 2^{Kg} less in water.

5. A substance which weighs 20% more in air than in water.

6. A substance which weighs 20% less in water than in air.

7. A bar of iron which weighs 13.3 lb. in water and 2 lb. more in air.

8. A cubic centimeter of lead which weighs 11.3^{g}.

9. A rock containing 600^{ccm} and weighing 1590^{g}.

10. A bar of metal 5^{m} long, 8^{cm} wide and 2^{cm} thick, weighing 20.48^{Kg}. It is probably what metal?

11. A block of freestone 2.8^{m} long, 1^{m} wide and $.75^{m}$ thick, weighing 3^{T} 465^{Kg}.

12. A bar of iron weighing 7.5 lb. in air and 6.5 in water is fastened to a piece of wood weighing 5 lb. in air. Both together weigh 3.6875 in water. What is the specific gravity of the wood?

Weight of both in air = 12.5 lb.
" " " water = 3.6875
" water displaced by both = 8.8125 lb.
" " " iron (7.5 − 6.5) = 1.
" " " wood = 7.8125 lb.
Hence, specific gravity of the wood = 5 lb. ÷ 7.8125 = .64.

13. A lead weight of 45.2 lb. in air and 42.2 lb. in water is attached to a piece of cork which weighs in air 15 lb. In water both together weigh 7.2. What is the specific gravity of the cork?

14. A sheet of zinc weighing 10.65^{Kg} in air, and 9.15^{Kg} in water, was wrapped around a pine board weighing 5^{Kg}. The two were then immersed in water, and weighed only 1.65^{Kg}. Find the specific gravity of the wood.

15. How can you find the specific gravity of wood, or any other substance which floats on water?

16. What is the weight of a marble slab 2^{m} long, 1.2^{m} wide and 2^{m} thick?

Cubic contents = $200^{cm} \times 120^{cm} \times 2^{cm} = 48000^{cu.\ cm}$.
$48000^{cu\ cm} \times 2.73$ (sp. g. of marble) $= 131040^{cu.\ cm} = 131040^{g} = 131.04^{Kg}$.

17. What is the weight of a block of marble 1.4^{m} long, $.8^{m}$ wide and $.5^{m}$ thick?

18. What is the weight of a bar of wrought iron 16^{m} long and 5^{cm} in width and thickness?

19. Find the weight of a block of granite 2.5^{m} long, 1.4^{m} wide and 1^{m} thick.

20. Express in kilos (kilograms) and in pounds the weight of a bar of silver 1^{m} long, 4^{cm} wide and $2\frac{1}{2}^{cm}$ thick.

21. A cubic foot of water weighs $62\frac{1}{4}$ lb. What is the weight of a cubic foot of cast iron?

62.25 lb. × 7.15 (sp. g. of cast iron) = 445.0875 lb. **Ans.**

What is the weight of:

22. A cubic foot of gold?

23. A cubic yard of platinum?

24. A cubic yard of ice?

25. A thousand common brick of the ordinary size ($18\frac{1}{2}^{cm} \times 9^{cm} \times 6^{cm}$)?

EXAMINATION PAPER. No. 10.

(TIME, 1 HOUR. VALUE OF EACH QUESTION, 10.)

1. What quantity of phosphate will be required for an acre of ground, allowing 3 lb. to 20 sq. yds.?

2. A cog-wheel which has 48 cogs turns another which has only 9 cogs. How many turns must be made by each wheel before the cogs which were together when starting will be together again?

3. How many loads of loam, each 1 cubic yard, will be required to spread 4 in. deep over a garden 54 ft. long and 30 ft. wide?

4. Express $\frac{5}{14}$ of $\frac{3\frac{1}{2}}{10}$ decimally, and divide 2.3 by it.

5. Bought 500 kilos of beef at 20 cents per kilo and sold it at 10 cents a pound. What was the gain?

6. What sum of money must be lent, at simple interest, for $3\frac{1}{2}$ years at 6% to amount to $871.20?

7. A cubic foot of air, under ordinary conditions, weighs .0803 lb. What is the weight of the air in a school-room 30 ft. x 25 ft. x 12 ft.? What weight of water would the same room hold? [1 cubic foot of water = $62\frac{1}{4}$ lb.]

8. A cellar 30 ft. long and 24 ft. wide is to be walled by a wa l 8 ft. high and 2 ft. thick. Find the contents of the wall in cubic yards.

9. What is the cost of plastering the walls and ceiling of a room 5.6^{m} long, 4.4^{m} wide and 3.5^{m} high, at $0.35 per square meter?

10. Three boys, Donald, Allister and Carl, went fishing. Donald had 5 biscuits and Allister had 3. After lunch—at which the three boys ate, share and share alike—Carl threw down 8 cents to pay for the biscuits he had eaten. How many cents is each of the others entitled to?

EXAMINATION PAPER. No. 11.

(TIME: ONE HOUR. VALUE OF EACH QUESTION, 10).

1. Divide 234567890987 by 987654.

2. A drover bought 79 oxen at $12 each and sold 25 of them at $40 each. At how much per head must he sell the rest to gain $544 on the whole transaction?

3. Find the G. C. D. and L. C. M. of 72, 90, 128 and 150.

4. Simplify $\frac{2\frac{1}{4} - \frac{2}{3} \text{ of } 1\frac{5}{6}}{\frac{1}{5} \text{ of } 3\frac{1}{3} + \frac{1}{3}\frac{3}{6}}$

5. How many sovereigns will weigh 1 lb. avoirdupois if 1869 weigh 40 lbs. troy?

6. How many cubic inches in the legal gallon in Canada? Compare the pound avoirdupois with the pound troy and pound apothecaries.

7. Express $\frac{2}{7}$ of $\frac{1}{2}$ of $22\frac{3}{4}$ lbs. as the decimal of a ton.

8. In a school section a tax of $900 is to be raised. If the amount of taxable property is $180000, what will be the tax on 1 dollar, and what is the tax on a property valued at $1750?

9. When water is converted into steam, its volume becomes about 1694 times greater. Find the weight of water (1 cu. ft. = $62\frac{1}{4}$ lb.) which would be sufficient to fill with steam a hall 28 ft. long, 20 ft. wide and 12.1 ft. high?

10. The diameter of a sphere is 50 inches. How many cubic feet in it?

ANSWERS.

Exercise I.—(Page 5).—1. 6 fur. 26 rd. 3 yd. 2 ft.
2. 8 cwt. 88 lb. 14 oz. $3\frac{5}{8}$ dr. 3. 11s. 8d.
4. 34 sq. rd. 8 sq. yd. 5 sq. ft. $113\frac{1}{7}$ sq. in. 5. 14 oz. $8\frac{8}{17}$ dr.
6. 34 rd. 4 yd. $10\frac{2}{11}$ in.
7. 147 A. 110 sq rd. 23 sq. yd. 2 sq. ft. $60\frac{1}{18}$ sq in. 8. 60 da. 20 hr.
9. 1 ft. 8 in. 10. 10s. 8d. 11. 1 pk. 1 gal. 3.312 qt.
12. 31 rd. 1 yd. 3.6 in. 13. 17 cwt. 76 lb.
14. 4 A. 25 sq. rd. 18 sq. yd. 1 sq. ft. 50.4 sq. in. 15. 12s. 6d. 2.4 far.
16. $2^{\text{lb}}\ 9^{\text{lb}}\ 4^{\text{s}}\ 6^{\text{s}}$. 17. 92 sq. rd. 18. 3 sq. yd. 4 sq. ft. 7.2 sq. in.
19. 2 mi. 3 fur. 13 rd. 3 yd. 2 ft. 6.6 in. 20. 13 cwt. 36 lb. 12 oz. 12.8 dr.

Exercise II.—(Page 6).—1. $\frac{1}{4}$ T 13 cwt. 33 lb. 15 oz. $9\frac{3}{5}$ dr.
2. 15 lb. 1 oz. 13 dwt. $3\frac{3}{5}$ gr. 3. 1 A. $97\frac{1}{7}$ sq. rd. 4. 9 bu. 2 pk. $\frac{1}{3}$ qt.
5. 6 fur. 16 rd. 4 yd. 1 ft. 8 in. 6. £8 11s. $8\frac{3}{10}$d. 7. 51.3125$^{\text{Km}}$.
8. 1 T. 10 cwt. 69 lb. 6 oz. $10\frac{2}{3}$ dr. 9. 67 da. 6 hr. $35\frac{1}{4}$ min.
10. 38 yd. 2 ft. $8\frac{1}{2}$ in. 11. 4 T. 18 cwt. 35 lb. 12. $27.872.
13. 2 cwt. 54 lb. 13 oz. 8 dr. 14. 2666.025$^{\text{g}}$.
15. 92 da. 15 hr. 44 min. $40\frac{2}{11}$ sec.

Exercise III.—(Page 7).—1. $\frac{1}{3}$. 2. $\frac{1}{12}$. 3. $\frac{1}{4}$. 4. $\frac{3}{8}$. 5. $\frac{1}{4}$.
6. $\frac{1}{14}$. 7. $\frac{17}{18}$. 8. $\frac{55}{56}$. 9. $\frac{3}{5}$. 10. $\frac{1}{5}$. 11. $\frac{6}{7}$. 12. $\frac{3}{17}$.

Exercise IV.—(Page 8).—1. .1875 T. 2. £.584375.
3. .119375 mi. 4. $.13. 5 .32738+. 6. .894$^{\text{Kl}}$ 7. .734375.
8. .00125 sq. mi. 9. .00225 lb. 10. .25.

Exercise V.—(Page 9).—1. 273 4 yd. 2. 451.438 + yd.
3. 236.22 + ft. 4. 1093.6 yd. 5. 14.55 + $^{\text{m}}$. 6. 546.81 + $^{\text{m}}$.
7. 666.8262$^{\text{m}}$. 8 16.35 + $^{\text{m}}$. 9. 6 mi. 1 fur. 28 rd. 2 yd. 4 + in.
10. 4228.1856$^{\text{m}}$. 12. 62 mi. 1 fur. 3 rd. 4 yd. 1 ft. 10.32 in.
13. 97 223 + mi. 14. 160.935$^{\text{Km}}$. 15. 86.1 + $^{\text{Km}}$.

Exercise VI.—(Page 10).—1. 83.638 qt. 2. 199 gal. 1.524 pt.
3. 20.63 + bu. 4. 68 bu. 3 gal. 1.6 pt. 5. 499 bu. 3 pk. 1 gal. 3 qt. 1.6 + pt.
6. 454.4$^{\text{l}}$. 7. 1882.92$^{\text{l}}$; 18.8292$^{\text{Hl}}$. 8. 23.75376$^{\text{Hl}}$. 9. 28.7165$^{\text{Hl}}$.
10. 113.73$^{\text{Hl}}$. 11. $.8236. 12. $1237.95. 13. $2.42. 15. $396.18.
16. $264.87. 17. $264.87. 18. 25 cents. 19. $13.755. 20. $6.88.*

Exercise VII.—(Page 11).—1. 1 lb. 5 oz. 2.6 dr.
2. 1 lb. 7 oz. 5 dwt. 19.2 gr. 3. 1 lb. 7 oz. 2 dr. 19.2 gr.
4. 4309.2$^{\text{g}}$.; 430 92$^{\text{Dg}}$. 5. 290.302$^{\text{Kg}}$. 6. 5 $^{\text{T}}$. 7. 190.14675 lb.
8. 27 T. 11 cwt. 15 lb. 9. 11 oz. 7 dwt. 22.6 gr. 10. 6.1728 gr.
11. $2.20+. 12. $10.23. 13. $7.80. 14. 165.06 lb. 15. $6.30.
16. $26.45+. 17. $45.72. 18. $18.72. 19. 1051$^{\text{g}}$+. 20. $30.95.

Examination Paper, No. 1.—(Page 12).—1. 41775360 ft.
2. 4 ft. 8 in. 3. $12\frac{1}{2}$ ft. 4. £1. 5. 22 bu. 1 pk. 2 qt. 6. $\frac{1}{720}$.
7. $16.41. 8. £.525. 9. $\frac{5}{21}$. 10. 99.779 + $^{\text{Km}}$.

Examination Paper, No. 2.—(Page 13).—1. 3s. 6d.
2. 15 times. 3. 154781 in. 4. 112 lb. 4 oz. 19 dwt. 4 gr.
5. 15 cords. 6. $13\frac{3}{8}$ days. 7. $66. 8. $20.85. 9. 2112 rails.
10. $3.24.

Examination Paper, No. 3.—(Page 13).—**1.** $450. **2.** 35. **3.** $47.38+. **4.** $\frac{17}{64}$. **5.** 5 fur. 33 rd. 1 yd. 2 ft. 6 in. **6.** 17 bu. 1 gal. 3 qt. **7.** $12. **8.** $52.32. **9.** $22. **10.** $235.60.

*In questions like No. 20, we give the actual sum which must be paid. Here it is $6.88, not $6.8775.

Exercise VIII.—(Page 15).—**1.** $600.56+. **2.** 50 tons 15 cwt. **3.** $13520.57+. **4.** $3.39. **5.** $14.245. **6.** $6.50. **7.** 54 mi. $201\frac{9}{11}$ rods. **8.** £404.875. **9.** $1.75. **10.** 36 men. **11.** $85\frac{1}{3}$ yds. **12.** 396 feet.

Exercise IX.—(Page 17).—**1.** $0.60. **2.** $2835. **3.** $3934. **4.** $550. **5** $352 16.

Exercise X. (Page 18).—**1.** 18 loads. **2.** 49 mi. **3** 14 loads. **4.** 54 mi. **5.** $36. **6.** 10 horses. **7.** $12\frac{1}{2}$ days. **8.** 99 cwt. **9.** $5832. **10.** 2500 tons. **11.** 22 days. **12.** $135. **13.** $6.00. **14.** 45 men. **15.** 972 men. **17.** $128.80. **18.** 13 days. **19.** 98 days. **20.** 10 horses. **21.** 18 days. **22.** 14 days. **23.** 288 cords. **24.** 1368 cu. meters. **25.** $202.50. **26.** $83.64. **27.** 9 men.

Exercise XI.—(Page 20).—**1.** $2\frac{1}{7}$ days. **2.** $4\frac{4}{7}\frac{3}{7}$ hours. **3.** $3\frac{3}{8}\frac{1}{8}$ days. **4.** $6\frac{1}{3}\frac{1}{1}$ min.; $\frac{3}{8}\frac{1}{0}$. **5.** $5\frac{5}{11}$ days. **6.** $\frac{3}{20}$. **7.** 4 days. **8.** $10\frac{1}{2}$ hs. **9.** $3\frac{1}{3}$ days. **10.** 30 days. **11.** 80 min. **12.** 300 men.

Examination Paper, No. 4.—(Page 21).—**1.** $\frac{43}{240}$. **2.** .100305+. **3.** £0 14s. $0\frac{1}{16}$. **4.** 60 rods. **5.** 10936.111 yds. **6.** 10977120 sq. in. **7.** 10 tons. **8.** $5520. **9.** $\frac{11}{20}$. **10.** $198.00.

Exercise XII.—(Page 22).—**1.** $\frac{3}{100}$, .03, 3%. **2.** $\frac{1}{50}$, .02, 2%. **18.** $1\frac{1}{2}$, 1.5, 150%. **21.** $\frac{1}{8}$, .125, $12\frac{1}{2}$%. **22.** $\frac{1}{15}$, $.06\frac{2}{3}$. **23.** $\frac{1}{3}$, $33\frac{1}{3}$. **24.** $\frac{1}{16}$, .0625. **25.** $\frac{1}{6}$, $.16\frac{2}{3}$. **26.** $\frac{1}{7}$, $.14\frac{2}{7}$. **27.** $\frac{1}{9}$, $.11\frac{1}{9}$. **28.** $\frac{1}{11}$, $.09\frac{1}{11}$. **29.** $\frac{2}{3}$, $.66\frac{2}{3}$. **30.** $\frac{7}{8}$, .875. **31.** $\frac{2}{200}$, .005. **32.** $\frac{1}{300}$, $.003\frac{1}{3}$. **33.** $\frac{1}{400}$, .0025. **34.** $\frac{1}{500}$, .002. **35.** $\frac{1}{1500}$, $.006\frac{2}{3}$. **36.** $\frac{7}{800}$, .00875. **37.** $\frac{11}{400}$, .0275. **38.** $\frac{1}{32}$, .03125. **39.** $\frac{23}{500}$, .046. **40.** $\frac{67}{1000}$, .057.

Exercise XIII.—(Page 24).—**1.** 1.5. **2.** 8.1. **3.** 44.8. **4** $102. **5.** 54.4. **6.** $33. **7** $605. **8.** $1.95. **9.** $8.775. **10.** $.255. **11.** 55 acres. **12.** 98 yds. **13.** 509.3m. **14.** $.64. **15.** $4.431. **16.** $5.56\frac{1}{4}$. **17.** 66.5Kg. **18.** $85\frac{1}{3}$ bu. **19.** $1.80. **20.** $6.60. **21.** $3 30. **22** $15. **23.** $6.40. **24.** $187.50. **25.** $406.25. **26.** $66. **27.** $135. **28.** $573.75. **29** $25.30. **30.** $47.04. **31.** 196. **32.** 147. **33.** $362.70. **34.** 250 A. **35.** 525 T. **36.** 120. **37.** $1665.30. **38.** $120. **39.** 1.76m. **40.** 13216.66\frac{2}{3}$.

Exercise XIV.—(Page 26).—**1.** 50%. **2.** 20%. **3.** 30%. **4.** 100%. **5.** $33\frac{1}{3}$%. **6.** 25%. **7.** $2\frac{1}{2}$%. **8.** $8\frac{1}{3}$%. **9.** 30%. **10.** $33\frac{1}{3}$%. **11.** 75%. **12.** $12\frac{1}{2}$%. **13.** $4\frac{1}{2}$%. **14.** 25%. **15.** $16\frac{2}{3}$%. **16.** $27\frac{7}{9}$%. **17.** $12\frac{8}{31}$%. **18.** $11\frac{1}{9}$%. **19.** $4\frac{1}{13}$%. **20.** $8\frac{1}{3}$%. **21.** 20%. **22.** 30%. **23.** 11%. **24.** $27\frac{1}{13}$%. **25.** $34\frac{3}{43}$%. **26.** 96%. **27.** 85%. **28.** 20%. **29.** 42%. **30.** 82%.

Exercise XV.—(Page 27).—**1.** 150. **2.** 125. **3.** 600. **4.** 425. **5.** 460. **6.** 650. **7.** 900. **8.** 3200. **9.** 288. **10.** 5600. **11.** 750. **12.** 1850. **13.** 400. **14.** 3040. **15.** 2600. **16.** 1900. **17.** 775. **18.** 850. **19.** 98. **20.** 854. **21.** 963. **22.** 927. **23.** 475. **24.** 3650. **25.** $300. **26.** $140. **27.** $2500. **28.** 300 bu. **29.** 107.5. **30.** $87.40. **31.** $285. **32.** $2680. **33.** 2000 bu. **34.** 1620 miles. **35.** $3864.

Exercise XVI.—(Page 29).—1. 720. 2. 375. 3. 410. 4. 240. 5. 300. 6. 225. 7. 354. 8. 528. 9. 1000. 10. 880. 11. 200. 12. 800. 13. 500. 14. 285. 15. 3109. 16. 417. 17. 918. 18. Every number. 19. 28. 20. 74. 21. 380. 22. 900. 23. 340. 24. 1360. 25. 520 and 780. 26. 276 and 460. 27. 150$\frac{1}{4}$ and 280. 28. 180 and 360. 29. 360 and 504. 30. 500 and 704$\frac{4}{5}$. 31. $550. 32. $1300. 33. $1060. 34. 416$\frac{2}{3}$ bu. 35. $800. 36. $8050. 37. $18.20. 38. 850 men. 39. $25.50. 40. $1000 and $800.

Exercise XVII.—(Page 32).—1. $4. 2. $140. 3. $22.50. 4. $2000. 5. $49200. 6. $266. 7. $3.11. 8. $1.53. 9. 6.73. 10. 2$\frac{1}{2}$ cents, 3 cents. 11. $45.72. 13. 25%. 14. 10%. 15. 18%. 16. 15%. 17. 48 cents. 18. $98.01. 19. $126400. 22. $120. 23. $275. 24. 14$\frac{2}{7}$%. 25. Nothing. 26. Loss $200. 27. 25 cents. 28. Gain $16. 29. 42$\frac{8}{9}$. 30. 30%.

Examination Paper, No. 5.—(Page 34).—1. 28. 2. 108.90. 3. 300.11. 4. $117.95. 5. $1. 6. $494. 7. 44$\frac{4}{9}$%. 8. $126. 9. 12$\frac{1}{2}$%. 10. 1680 lb.

Exercise XVIII.—(Page 36).—1. $24.38. 2. $33.21. 3. $6.50. 4. $226.95. 5. $14.24. 6. $39.75.

Exercise XIX.—(Page 39).—1. $10. 2. $450.30. 3. 300 bbl. 4. $30. 5. $31.92. 6. $120, $115.38. 7. $8000. 8. 2000 bbl. 9. $606.30. 10. $15.77, $8.73, $290.90.

Exercise XX.—(Page 40).—1. $37.50. 2. $54. 3. $352. 4. $1854. 5. $256, $198. 6. $1200. 7. $204.46, $100. 8. $66.75.

Exercise XXI.—(Page 42).—1. $75. 2. $162. 3. $37.80. 4. $76.80. 5. $166. 6. $156. 7. $156. 8. $88.62. 9. $2148.60. 10. $263.55. 11. $7.62. 12. $13.68. 13. $1618.75. 14. $11.60. 15. $24.08. 16. $24.24. 17. $18.03. 18. $7.22. 19. $90.67. 20. $16.39.

Exercise XXII.—(Page 43).—1. $6.51+. 2. $74.05. 3. $37.53. 4. $17.12. 5. $1796.38. 6. $662.05. 7. $83.61. 8. $10.15. 9. $77.13. 10. $411.38. 11. $1.465. 12. $54.90. 13. $49.31. 14. $8.59. 15. $.57. 16. $36.83. 17. $125.74. 18. $80.37. 19. $152.40. 20. $136.24. 21. $880. 22. $409.20. 23. $823.49. 24. $962.70. 25. $1156.72. 26. $6886.20. 27. $416.22. 28. $1.21. 29. $29.79. 30. $699.79.

Examination Paper, No. 6.—(Page 45).—1. 64c. and 36c. 2. 30 days. 3. $10. 4. $126. 5. $750. 6. 27. 7. $17.28. 8. $26264. 9. 2$\frac{1}{2}$%. 10. $38.63.

Exercise XXIII.—(Page 47).—1. $78.81+. 2. $47.75. 3. $169.86. 4. $21.57. 5. $5.93. 6. $68.375. 7. $202.935. 8. $13.24. 10. $40.16. 11. $7.96. 12. $11.11. 13. $36.72. 14. $105.06. 16. $124.55. 17. $27.19. 18. $44.78. 19. $580.27. 20. 293.58. 21. $383.78.

Exercise XXIV.—(Page 50).—1. 6%. 2. 5$\frac{1}{2}$%. 3. 4$\frac{1}{2}$%. 4. 5$\frac{1}{2}$%. 5. 4$\frac{3}{4}$%. 6. 8%. 7. 4%. 8. 5%. 9. 7%. 10. 5$\frac{1}{2}$%.

Exercise XXV.—(Page 50).—1. 4 years. 2. 3 years.
3. 3½ years. 4. 4½ years. 5. 3 years 219 days. 6. 3½ years.
7. 4½ years. 8. 3¼ years. 9. 250 days. 10. ½ year.

Exercise XXVI.—(Page 51).—1. $860. 2. $645. 3. $1765.
4. $5875. 5. $894. 6. $800. 8. $288. 9. $435. 10. $385.82.

Exercise XXVII.—(Page 53).—1. $2.68 and $172.32.
2. $5.75 and $293.88. 3. $2.42 and $249.74.

	Date of Maturity.	Term of Discount.	Discount.	Proceeds.
4.	Sept. 11, 1894.	80 days.	$ 9.86	$740.14
5.	Mar. 11, 1890.	63 "	$ 6.04	$493.96
6.	Jan. 4, 1895.	64 "	$ 2.63	$247.37
7.	July 5, 1894.	50 "	$ 2.97	$307·03
8.	June 5, 1884.	95 "	$11.39	$613.61
9.	April 8, 1888.	63 "	$ 1.66	$158.34
10.	Jan. 22, 1895.	52 "	$ 9.97	$990.03

Exercise XXVIII.—(Page 55).—1. A $600; B $1000; C $1200.
2. 120, 140, 160. 3. 160 lbs. 4. 1800 lbs. 5. $154; $176; $220.
6. $42105. 7. A $14.76; B $22.14; C 33.21.
8. A $900; B $600; C $300. 9. $400; $800; $1600.
10. $12.24; $8.16, $6.12.

Exercise XXIX.—(Page 57).—1. A $320; B $440; C $560.
2. A $2250; B $1500; C $750. 3. X $78.75; Y $236.25; Z $157.50.
4. A $75; B $60; C $90; D $75. 5. A $7.50; B $9.37½; C $13.12½.
6. Wife $1350; Son $900; Daughter $800.

Exercise XXX.—(Page 58).—1. A's $105; B's $144; C's $150.
2. A $33; B $30; C $36. 3. A $150; B $225; C $600.
4. A's $42; B's $80; C's $48.
5. 1st $700; 2nd $630; 3rd $840; 4th $1260.

Exercise XXXI.—(Page 60).—1. 16. 2. 17. 3. 19. 4. 23.
5. 28. 6. 45. 7. 75. 8. 49. 9. 57. 10. 68. 11. 87. 12. 94.

Exercise XXXII.—(Page 60).—1. 512. 2. 453. 3. 286.
4. 562. 5. 3166. 6. 5008. 7. 31060. 8. 4879. 9. 12345.
10. 23456. 11. 60007. 12. 10500.

Exercise XXXIII.—(Page 61).—1. 2.6343+. 2. 4.3243+.
3. .4192. 4. .0395+. 5. .0036. 6. 1.4142+. 7. 1.7320+.
8. 11.2267+. 9. .0316+. 10. .3162+. 11. .0070+. 12. 7.9900+.
13. 3.2186+. 14. 32.7859+. 15. 6.7823+. 16. 9.3541+.
17. 1.0488+. 18. .2121+.

Exercise XXXIV.—(Page 62).—1. 100. 2. 96. 3. 105.
4. 31.12+. 5. 360.55+. 6. 94.33+. 7. 75. 8. 89.02+.

Exercise XXXV.—(Page 64).—1. 22⅛ sq. yds. 2. $26.04+.
3. $8.33+. 4. $8.537+. 5. 24 ft.

Exercise XXXVI.—(Page 65).—1. $39.75. 2. $24.51. 3. $392.
4. $259.55+. 5. $45.57.

Exercise XXXVII.—(Page 66).—1. $5.016. 2. $3.23+.
3. $2.888. 4. $21.94+. 5. $55.64+. 6. $31.64+. 7. $23.324.

Exercise XXXVIII.—(Page 67).—1. 375 sq. ft.
2. 9 a. 80 rods 20 yds. 3. 307.5 sq. yds.
4. 37 a. 30 rods 12 sq. yds. 4 sq. ft. 72 sq. in. 5. 160 yds.

Exercise XXXIX.—(Page 68).—1. 75000 sq. ft. 2. 90 sq. yds. 3. 540000. 4. 30.25 sq. in. 5. $1500.

Exercise XL.—(Page 69).—1. 400 sq. ft. 2. 500 sq. ft. 3. $700. 4. $1388.42+. 5. $1\frac{8}{8}\frac{9}{3}$.

Exercise XLI.—(Page 70).—1. 251.328 ft. 2. 94.248 ft. 3. 973.896 yds. 4. 500 ft. 5. 30.

Exercise XLII.—(Page 71).—1. 706.86 sq. ft. 2. 5026.56 sq. meters. 3. 4.90875 sq. ft. 4. 6.324 yds. 5. 20 rods. 6. 78.54 sq. rods. 7. 28.28+ yds. 8. 113.0976 sq. yds. 9. 1256.64 sq. ft. 10. 314.16 yds.

Exercise XLIII.—(Page 72).—1. 36 b. ft. 2. $22\frac{1}{2}$ b. ft. 3. $56\frac{7}{8}$ b. ft. 4. $52\frac{1}{2}$ b. ft. 5. $16\frac{1}{2}$ b. ft. 6. $97\frac{1}{2}$c. 7. $937\frac{1}{2}$ b. ft. 8. $16.632. 9. $266\frac{2}{3}$ b. ft. 10. $18.20.

Exercise XLIV.—(Page 74).—1. 2245.83+cu. ft. 2. 2.37+cu. yds. 3. $4\frac{3}{4}$ cords. 4. 1081.6 cu. ft. 5. 600 cu. ft. 6. $28.444. 7. 31.41+cu. yds. 8. 61.18 cu. yds. 9. 6730.67 gals. 10. 23800 liters.

Exercise XLV.—(Page 75).—1. 25.1328 cu. ft. 2. 1178.1 cu. ft. 3. 132.1+ bus. 4. 4.8+ bus. 5. 440.52 gals.

Exercise XLVI.—(Page 76).—1. 147 cu. yds. 2. 628.32 cu. ft. 3. $17\frac{5}{2}\frac{5}{7}$ cu. yds. 4. 269.3922 cu. ft.

Exercise XLVII.—(Page 77).—1. 904.7808 cu. in. 2. 24429.08 cu. ft. 3. 1212.03+lbs.

Examination Paper, No. 7.—(Page 77).—1. $\frac{6}{7}$. 2. 1.191016. 3. $2.80. 4. .0003. 5. 2023 lbs. 6. 305.58 yds. 7. A $15; B $20; C $24. 8. 31.416 inches. 9. 78.54 sq. in. 10. 3067.96 lbs.

Examination Paper, No. 8.—(Page 78).—1. $20000. 2. $4\frac{1}{2}$ days. 3. 24.8 bus. 4. $4600 and $5000. 5. A's $750, B's $400. 6. $336.22. 7. $14.76. 8. $11.62+. 9. $3\frac{1}{4}\frac{7}{4}$ rods. 10. 5.138+.

Examination Paper, No. 9.—(Page 79).—1. $0.39. 2. 6%. 3. $3\frac{1}{2}$ days. 4. $16\frac{2}{3}$ hours. 5. A $1200; B $1400; C $2000. 6. $595.508. 7. 2274 sq. ft. 8. 1363 sq. ft. 9. 4645.6+. 10. 62.832 ft.

Exercise XLVIII.—(Page 81).—1. 8.8. 2. 1.91. 3. 2.288. 4. 3. 5. 6. 6. 5. 7. 7.65. 8. 11.3. 9. 2.65. 10. 2.56 Al. 11. 1.65. 13. .3. 14. .4. 17. 1.5288^{T}. 18. 310.8^{lbs}. 19. 9.52^{T}. 20. 10.5^{lbs}. 22. 1201.425 lbs. 23. 18 ton 136.125 lbs. 24. 1563.0975 lbs. 25. 1998^{lbs}.

Examination Paper, No. 10.—(Page 83).—1. 726 lbs. 2. Large 3, Small 16. 3. 20 loads. 4. 18.4. 5. $10.23. 6. 720. 7. 727.2 lbs.; 280 tons 250 lbs. 8. $59\frac{5}{7}$ cu. yds. 9. $33.124. 10. Donald 7; Allister 1.

Examination Paper, No. 11.—(Page 84).—1. $237500\frac{6}{8}\frac{6}{7}\frac{6}{6}\frac{6}{4}$. 2. $53. 3. 2; 28800. 4. 1. 5. $56\frac{3}{8}\frac{2}{4}$ sovs. 7. .001625. 8. Half a cent; $8.75. 9. 249 lbs. 10. $37\frac{1}{8}\frac{8}{4}\frac{7}{4}$ cu. ft.